

# PUBLIC HEALTH REPORTS

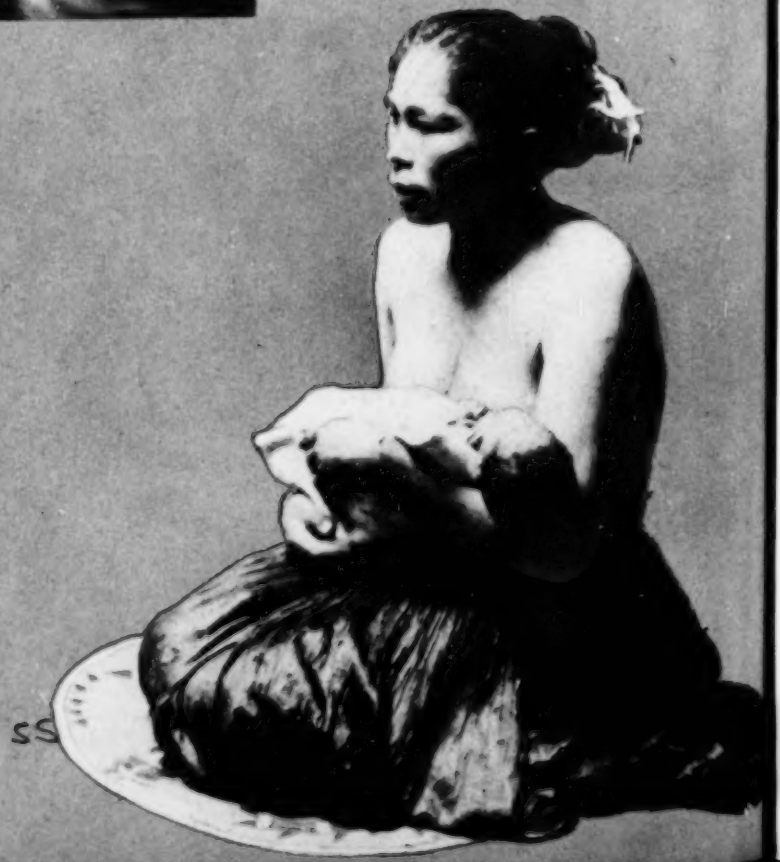
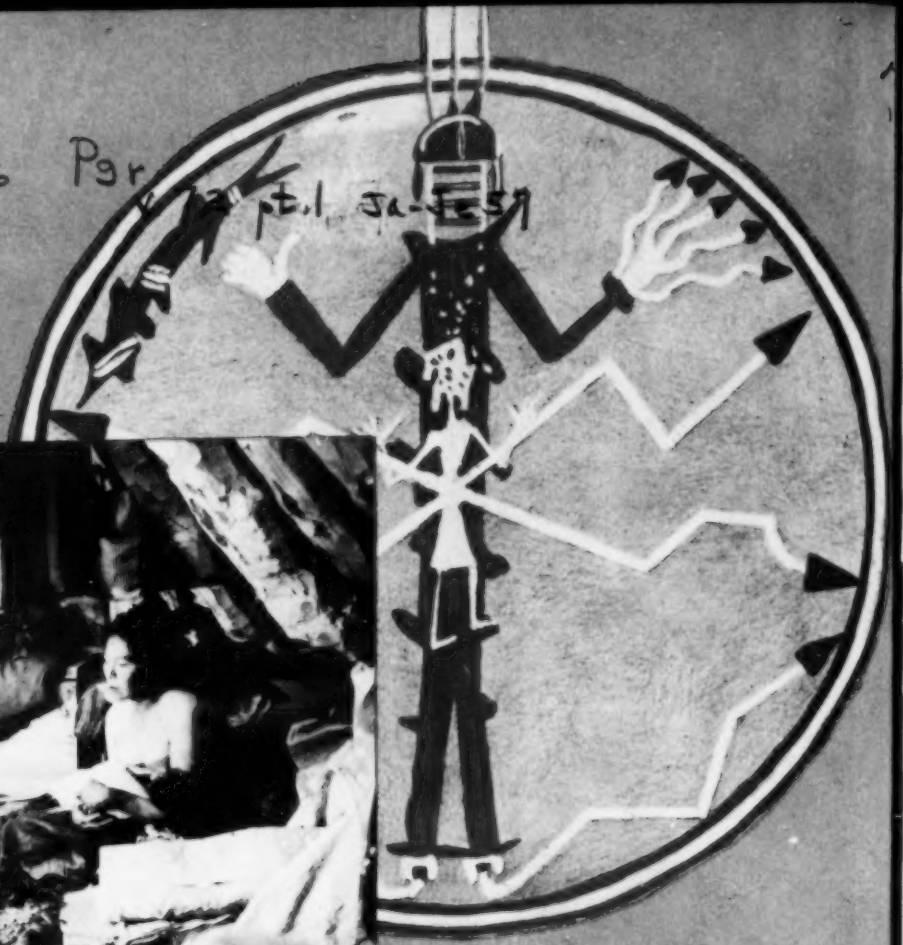
*In this issue*



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# PUBLIC HEALTH REPORTS

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## **CONTENTS**

The National Health Survey Act.....	<i>Page</i> 1
Organization of National Health Survey.....	5
Supply, distribution, and use of poliomyelitis vaccine..... <i>Jack C. Haldeman</i>	9
Mental patient data for fiscal year 1956.....	14
A survey of chiropteran rabies in western Montana..... <i>J. Frederick Bell, W. J. Hadlow, and William L. Jellison</i>	16
The state of the Nation's public health services.....	19
New highways to health..... <i>Leroy E. Burney</i>	19
Training mental health personnel..... <i>Robert H. Felix</i>	24
Perspectives in child health..... <i>Martha M. Eliot</i>	28
Cardiovascular-renal and diabetes deaths among the Navajos..... <i>Robert Lincoln Smith</i>	33
Geographic variation in leukemia mortality in the United States..... <i>Brian MacMahon</i>	39
Public health and the people's health..... <i>Ernest M. Gruenberg</i>	47

Continued ►



## **frontispiece**

An ailing Navajo child receives the traditional tribal "cure." Holding the child, the mother squats on a sand painting drawn by a medicine man. (Photos courtesy of the American Museum of Natural History.)

# CONTENTS *continued*

	<i>Page</i>
Epidemiological methods and inferences in studies of non-infectious diseases. PHR review.....	51
<i>Abraham M. Lilienfeld</i>	
Personnel shortages in the health field and working patterns of women.....	61
<i>Walter L. Johnson</i>	
Clean air: Air Pollution Control Association meeting. Four briefs.....	67
The Louisville study, <i>August T. Rossano, Jr.</i> Automotive vehicle fumes, <i>Benjamin Linsky</i> Automotive industry effort, <i>F. W. Bowditch</i> Fluoride air pollution, <i>Charles R. Williams</i>	
Durability tests of stainless steel hospital utensils.....	77
<i>Arnold H. Dodge</i>	
The American Cancer Society.....	81
<i>Theodore Adams</i>	
Syphilis morbidity reporting by private physicians.....	85
<i>Eugene E. Taylor and John J. Wright</i>	
Short reports and announcements:	
Knutson 1957 APHA president.....	4
Prompt use of poliomyelitis vaccine.....	11
FDA renews Hoxsey warning.....	18
Dr. Eliot leaves Children's Bureau.....	32
Examinations open for scientists.....	38
CDC course in epidemiology for nurses.....	60
Fluoridation progress.....	75
Device for standardizing X-ray techniques.....	76
Professional nurse traineeship program.....	80
International mail pouch.....	84
Technical publications.....	94



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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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# The National Health Survey Act

WITHIN A FEW MONTHS, the Public Health Service will begin a survey of the health of the American people. On July 3, 1956, the President signed into law a bill authorizing a continuing survey of disease, injury, impairment, and disability in the United States. The program, located in the Division of Public Health Methods, will include a series of special studies to collect other detailed morbidity data and additional studies to evaluate the methods used in the survey.

## Historical Background

Twenty-one years ago last September, the last effort to obtain comprehensive statistics on illness in the general population was getting under way. The National Health Survey of 1935-36 was a tremendous undertaking in which interviewers visited 737,000 urban households to find out which members of the household had experienced disabling illness and which had specified chronic diseases or impairments.

In the years since the 1935-36 survey its findings have formed the basis for more than 200 reports, articles, and comparative studies. Even in recent years the urban statistics from that survey, generalized to the country as a whole and adjusted for population changes, have provided the only available estimates of the prevalence of many important diseases.

Although the National Health Survey of 1935-36 was by far the largest study ever devoted to learning the facts of illness and injury in the general population, it was not the first of its kind in this country. A number

of smaller studies had demonstrated that the interview method can provide useful information about the amount and distribution of disease, the circumstances of injury, the loss of time from work or other usual activities resulting from disease and injury, and the utilization of medical care in connection with morbidity. Best known of these are the Hagerstown, Md., studies of the early 1920's and the survey made during the years 1928-31 by the Committee on the Costs of Medical Care.

The smaller, community-type studies continued after 1936, and additional refinements were made in the techniques. An important example of an intensive community study is the Eastern Health District Study conducted in Baltimore by the Public Health Service and the Milbank Memorial Fund in the years 1938-43.

At the same time, great advances were made in the science of population sampling, with the Bureau of the Census leading the way in the development of practical methods for applying the theory of probability sampling in the field. In 1943 the Census Bureau, building upon an earlier survey by the Works Progress Administration, began to collect information on the labor force by conducting interviews each month in a national sample of households. Now known as the Current Population Survey, that survey, almost from its start, was used to satisfy some of the growing demand for national morbidity statistics by adding, from time to time, questions on illness to the basic questionnaire. As recently as September 1956 the Current Population Survey carried a supplement dealing with the utilization of hospital care.

Neither the intensive community studies nor the occasional limited data supplied by adding questions to the Current Population Survey

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*Prepared by the Division of Public Health Methods,  
Office of the Surgeon General, Public Health Service.*

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### Linder to Direct Program

Forrest E. Linder, Ph.D., has been named director of the National Health Survey Program of the Public Health Service. The new program will use scientific sampling techniques to survey the nature and extent of illness and disability in the population each year.

Formerly deputy chief of the National Office of Vital Statistics of the Public Health Service, Dr. Linder returns to the Service from the United Nations Statistical Office, where he was chief of the demographic and social statistics branch. During World War II he had technical responsibility for the reorganization of the medical statistics of the Navy.

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were capable of filling the increasing needs. Public health programs, both public and private, and health insurance plans, medical research efforts, and programs to conserve manpower were increasing in scope. A broader statistical base was needed for the planning and evaluation of these programs.

Furthermore, the national data collected in 1935 and 1936 were becoming increasingly inappropriate as descriptions of the current health of the population as a whole. Two wars, the "wonder" drugs, returning prosperity, and a great increase in the proportion of the population covered by hospitalization insurance brought changes whose effect on morbidity could not be measured. Overweight, smoking history, exposure to air pollution, and other aspects of the environment scarcely touched on in the earlier surveys had become significant factors in epidemiology.

### The National Committee

In January 1949 the United States National Committee on Vital and Health Statistics was established. Recognizing the obsolescence of the existing data, the committee gave immediate attention to the problem of obtaining adequate national morbidity statistics. Two successive ad hoc subcommittees were set up by the chairman of the national committee "to frame the problems in morbidity statistics, including

chronic diseases and medical care statistics, in order that morbidity data may be directly related to demographic factors." These subcommittees recommended study of a number of methodological questions, but, even as the recommendations were being made, steps were being taken in several parts of the country to get some of the answers in community surveys. About the same time a bill calling for an 18-month study of methods of measuring illness passed the Senate but failed of passage in the House of Representatives.

Within the next few years, sample surveys of illness were initiated in New York City, in San Jose, Calif., in Hunterdon County, N. J., and in Pittsburgh. Every one of these, as well as later surveys in Baltimore, Kansas City, and in the State of California contributed to the knowledge of how such data collection can be made more accurate and useful.

Anticipating the solution of the methodological problems raised in the ad hoc subcommittees, the chairman of the national committee, in February 1951, established the Subcommittee on National Morbidity Survey and charged it with the drafting of "a plan for a national morbidity survey keeping in view the interests of local areas." It was the report of this group that led to the proposal for specific legislative authorization for a continuing national program. This report (1), which is the basis for the present National Health Survey, contains a valuable list of the major applications of morbidity statistics. These are given on page 3.

### Provisions of the Act

The Department of Health, Education, and Welfare proposed in the summer of 1955 legislation specifically authorizing the Surgeon General of the Public Health Service to conduct a continuing survey of illness and disability in the Nation. A bill was drafted, made part of the President's legislative program on health matters, and introduced in both houses of Congress in February 1956. The few amendments added tended to strengthen the bill (2, 3), which passed the Senate in March and the House of Representatives in June. The Senate concurred in the House changes, and on

## Uses for Morbidity Statistics

*Administrative planning:* Statistics on the incidence and prevalence of illness and accidental injury and the resulting disability are used as a guide to administrative planning and the evaluation of public health programs. Illustrative applications of morbidity and disability statistics include the ranking of public health problems in order of importance and the determination of how resources should be divided among various programs; checking the adequacy of notifiable disease reporting; and analyzing trends of specific diseases to evaluate the effect of preventive and therapeutic innovations.

*Manpower problems:* Another application of morbidity statistics, particularly those providing measures of disability, is in the field of manpower problems. To estimate the economic loss to industry resulting from morbidity, information on absenteeism owing to disease and injury is required. Data on the numbers of persons with chronic diseases and handicapping conditions, and the employment status of such persons, will permit estimates of potential additions to the labor force. Statistics on the sickness rates of handicapped persons, as compared with the nonhandicapped, would be useful to industry and the armed services.

*Industrial use:* The pharmaceutical and appliance industries have an interest in statistics in order to estimate the markets for particular preparations and appliances. Such information should include data on the utilization of medical services of various types, for example, the frequency of particular operations and of prescriptions and the use of hearing aids and artificial limbs.

*Health education:* Accident prevention agencies require estimates of the national incidence of accidental injuries, by type and degree of disability. Estimates of the prevalence of cerebral palsy, multiple sclerosis, blindness, deafness, and many other diseases and impairments are needed by voluntary health agencies concerned with these conditions.

*Provision of health services:* Morbidity data are often used as the basis for estimates of the needs for hospital facilities, nursing home beds, home care programs, or other types of facilities or services. Such information may be used to estimate the number of persons requiring rehabilitation services, to help in planning the extension of the scope of medical care insurance, and for similar estimates in the field of medical care.

*Medical research:* While morbidity statistics from surveys of the general population are not suitable for making conclusive tests of hypotheses in medical research, they can be useful in suggesting hypotheses for further testing. For example, information on the association between the incidence or prevalence of various diseases and demographic factors, such as age, sex, marital status, occupation, and economic status, may point the way for more intensive investigations. Likewise, data on the geographic distribution of diseases will sometimes provide clues to their causes.

—Excerpts from "Proposal for Collection of Data on Illness and Impairments: United States," report of Subcommittee on National Morbidity Survey, United States National Committee on Vital and Health Statistics.

July 3 the President signed the bill. In late July, Congress appropriated funds for the first fiscal year of operation.

The major provisions of the National Health Survey Act follow.

"(a) The Surgeon General is authorized . . . to make, by sampling or other appropriate means, surveys and special studies of the population of the United States to determine the extent of illness and disability and related information . . . and . . . in connection therewith, to develop and test new or improved meth-

ods for obtaining current data on illness and disability and related information.

"(b) The Surgeon General is authorized, at appropriate intervals, to make available, through publications and otherwise . . . the results of surveys or studies made pursuant to subsection (a).

"(c) For each fiscal year . . . there are authorized to be appropriated such sums as the Congress may determine for carrying out the provisions of this section.

"(d) To assist in carrying out the provisions

of this section the Surgeon General is authorized and directed to cooperate and consult with the Departments of Commerce and Labor and any other interested Federal departments or agencies and with State health departments. For such purpose he shall utilize insofar as possible the services or facilities of any agency of the Federal Government and . . . of any appropriate State or other public agency, and may . . . utilize the services or facilities of any private agency, organization, group, or individual, in accordance with written agreements . . ."

Public Law 652 is in the form of an amendment, as section 305, to the Public Health Service Act of 1944 (Public Law 410, 78th Cong.). It also amends another section of the basic act by authorizing the Surgeon General to "make available, to health officials, scientists, and appropriate public and other nonprofit institutions and organizations, technical advice and assistance on the application of statistical meth-

ods to experiments, studies, and surveys in health and medical fields." In addition it is important to note that Public Law 652 provides that information collected under the authority of the act is to be obtained "on a non-compulsory basis."

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- (3) U. S. Congress, House of Representatives: National Health Survey Act. Report No. 2108 to accompany S. 3076. 84th Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1956.

### Knutson 1957 APHA President

Dr. John W. Knutson, Assistant Surgeon General and chief dental officer of the Public Health Service since 1952, is president of the American Public Health Association for 1957. He succeeds Dr. Ira V. Hiscock of Yale University.



Dr. Knutson first joined the Public Health Service in 1931. He was assigned to the States Relations Division in 1944 as chief of the Dental Section and later served as chief of the Division of Dental Public Health.

He was chairman of an international group of consultants convened in Geneva in 1954 by the World Health Organization prior to the

establishment of a permanent program of dental health. Long active in the Federation Dentaire Internationale, he is vice president of its Commission on Public Dental Health Services and chairman of the Subcommittee on Statistics. In 1955 Dr. Knutson joined the WHO staff for 6 months to organize its dental program.

He is a diplomate and founding member of the American Board of Dental Public Health, and since 1948 has been instructor in dental public health in the School of Dentistry, Georgetown University. Dr. Knutson is an editor of the Year Book of Dentistry and a contributing editor of Dentistry in Public Health by Pelton and Wisan. He is also the author of a number of reports on dentistry.

# Organization of National Health Survey

**T**HE THREE TYPES of activity authorized in the National Health Survey Act have as their purpose the obtaining of "accurate and current statistical information on the amount, distribution, and effects of illness and disability in the United States and the services received for or because of such conditions" (1). These three activities—a sample survey of the population, a series of special studies, and the development and testing of new or improved methods for obtaining current data—constitute the National Health Survey Program. To plan and direct the program, a small, experienced staff is being recruited in the Division of Public Health Methods of the Public Health Service.

The nucleus of the staff is already at work, drafting plans to implement the act. Successful execution of the program will require the assistance of health departments, the medical and dental professions, hospitals, and many other sources of health information. It is the understanding and cooperation of the general public, however, that is the most important ingredient of success.

The Bureau of the Census is providing expert help in designing the sample survey of the population. Technical consultants will give advice on all methodological aspects of the program. Three advisory committees will review the plans, keep the staff informed of needs for statistics which the program is capable of filling, and advise on obtaining the cooperation of professional groups and the public. One advisory committee will be drawn from operating agencies within the Department of Health, Education, and Welfare. A second committee will comprise representatives of all Federal departments and agencies having an interest in the data to be supplied.

The third committee will be made up of leaders from the professions and business and from State and local governmental fields.

In addition to those consultants and committees, the program staff will have frequent discussions with individual agencies and groups about ways in which the program can be made more useful.

Planning for the three phases of the National Health Survey Program is now going on. First priority is being given to setting up the sample survey of the population. Methodological studies are, of course, an essential part of the planning process and will continue throughout the program since improving the techniques and adding to the usefulness of the results should never be considered to be complete. Collection of data for the series of special studies will not begin until after the sample survey is under way.

Despite the fact that decisions on various points are not yet final, it is possible to describe now, in general terms, the plans for the program.

## The Household Survey

The sample survey phase of the program will consist of a continuous sampling of households on a national basis. Information will be collected in each household by carefully trained and supervised interviewers. The Bureau of the Census is devising sampling and field interviewing plans and preparing instruction and training manuals. The bureau will hire and train interviewers, supervise the field work, edit and code the questionnaires, and produce the required tabulations. The Public Health Service is responsible for the content of the survey questionnaire, for content of the tabulations that will be made of the replies, and for the analysis and publication of the results.

Field work on the household survey will start

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Office of the Surgeon General, Public Health Service.*

with pretesting activities on a small scale in early 1957. A "dry run" on a national scale will follow later in the spring. Collection of statistical information for periodic publication will begin about July 1.

### *The Questionnaire*

When the household survey is in full operation, the questionnaire for the interview will consist of two parts, core items and supplements. Core items will include only the most basic types of information and will remain on the questionnaire for a long period of time. During the dry run period of the survey, only core items will be on the questionnaire.

The core questionnaire, as presently planned, will provide information on the incidence of illnesses and injuries involving either medical care or loss of time from usual activities (for example, the number of days lost from work or school), or both. The prevalence of chronic conditions known to the family and of various types of impairments will be obtained to the extent that they have caused trouble for the individual within a year preceding the interview. Persons with chronic conditions will be classified according to the degree to which these conditions have limited their activities.

In addition, core questions will ascertain the number of visits to physicians and dentists and the number and duration of hospital stays as well as the number of operations performed while the family member has been in the hospital.

These various measures of illness, disability, and medical care will be classifiable, on the basis of information collected in the core questionnaire, by age, sex, race, marital status, educational attainment, income, occupation, and industry for those in the labor force, by usual activity for those not in the labor force, and by residence in farm and nonfarm areas. The illness will also be classifiable by diagnosis in broad groups and by physician attendance.

After the dry run, the questionnaire will be opened for special supplementary inquiries. In this way, flexibility in content can serve the interests of additional users of the data. The supplements may be repeated at regular intervals or may be included once only. Since the total amount of interviewing in any one month

will be relatively small, supplements may remain on the questionnaires for 3 months or longer depending on the degree of geographic detail required.

### *Collection of Data*

Initially, the sample of households will be selected within the 330 areas (counties, parts of counties, or metropolitan areas) that constitute the first stage of sampling for the Current Population Survey of the Census Bureau. The Current Population Survey has for some years been collecting information, from a national sample each month, on employment, unemployment, and other economic data. Except very rarely, and then by chance, the households interviewed for the National Health Survey will not be the households sampled in the Current Population Survey.

After the dry run, which has as its major purpose the establishment of smoothly operating procedures, the household survey will be expanded gradually over a 6-month period until it includes approximately 400-450 sample areas known as primary sampling units. The reason for this difference in the design of the two national samples is that the National Health Survey will require estimates in greater geographic detail than the Current Population Survey.

The number of interviews in the primary sampling units will be far fewer than in the Current Population Survey. The interview rate during the dry run will be approximately 3,000 households a month for the country as a whole. By the end of 1957 it is hoped to increase the rate to about 3,500 households a month. This is in contrast to the 35,000 households interviewed each month in the Current Population Survey.

A careful control on the quality of the interviewing will be maintained by a regular program of reinterviews, and other devices, in a subsample of the households.

### *Publication of Data*

The present plan is periodically to publish separate morbidity statistics for each of nine standard metropolitan areas: New York, Chicago, Los Angeles, Philadelphia, Detroit, San Francisco, Boston, Pittsburgh, and the com-

bined Washington, D. C.-Baltimore area. In addition, separate statistics will be published periodically for each of 11 geographic regions of the country. These correspond to the 9 standard geographic "divisions" of the Census Bureau, except that the East North Central Division and the South Atlantic Division each will be divided into two parts. Data from the regions will be shown separately for large metropolitan areas as a group, all other urban areas as a group, and rural areas.

To publish statistics in this maximum geographic detail, it will be necessary to accumulate data for a period of 2 years. However, summary statistics may be presented at more frequent intervals for four major Census Bureau regions of the country (Northeast, North Central, South, and West) as well as by size of place, in terms of population, for the country as a whole.

According to present plans, the most frequent publication of any particular statistical table will be at intervals of 3 months. Data for the preceding calendar quarter will be included. These published tables will be devoted to information for which it is desirable to show quarter-to-quarter change. An example might be the frequency of injuries resulting from automobile accidents.

### Special Studies

The special studies will produce auxiliary information of a type that the household interview cannot provide. They will be based either on subsamples of the national household sample or on separate samples. Though they may vary in nature, all special studies will be based upon scientifically designed samples so that the results can be generalized to a defined population. They will emphasize the measurement of disease by means of clinical tests, physical examinations, or the analysis of medical records. The entire health survey program is planned as an integrated system in which the special studies will supplement the data obtained in household interviews.

Because of wide interest in the prevalence of chronic diseases and impairments, including conditions not yet diagnosed, the first of the special studies will be designed to provide a

thorough medical and dental evaluation by a professional team for a cross-sectional sample of persons of all ages. The need for statistics on undiagnosed and nonmanifest conditions has been emphasized by the Subcommittee on National Morbidity Survey (2). Two recent surveys, one in Hunterdon County, N. J., and one in Baltimore, have demonstrated that, in conjunction with a household interview survey, the medical evaluation of a subsample can produce useful data.

The staff of the National Health Survey Program will conduct the studies with the help of field personnel employed for each study. Part of the work, however, such as the abstracting of medical records, may be contracted to organizations with access to the information needed.

Although first priority is being given to the household survey, staff and consultants of the program have begun to design the first of the special studies for the National Health Survey. Field work on this study, however, probably will not begin before late 1957.

### Methodological Studies

The third phase of the program will include methodological experiments in connection with the national household survey; studies to determine the nature and magnitude of errors of measurement associated with clinical tests and physical examinations; matching of data from one source against data from another; and basic investigation of entirely different methods of measurement, such as panels of physicians keeping records concerning the patients under their care.

The methodological studies will be conducted sometimes alone by the staff of the National Health Survey Program, and at other times in conjunction with the Bureau of the Census or other organizations. Some methodological problems may be investigated by schools of public health, health departments, health insurance agencies, or research groups employed on a contract basis.

### Limitations of the Program

"It is clear that this legislation would close a major gap in our population and health sta-

tistics. We have available today only piecemeal data—from special studies and surveys, from reports on particular kinds of diseases, or from records kept for a variety of purposes on particular segments of the population" (3).

"A national health survey based on a representative sample of the total population would provide a comprehensive picture of illness, both with respect to coverage of the population and to inclusion of the entire range of types of illness. As such it will supplement and extend existing sources of health data" (4).

These statements appeared in the Senate and House of Representatives reports on the proposed national health survey. However, recognition of the potential value of the survey in defining more clearly the extent of illness and disability in the Nation should not obscure the fact that the program has definite limitations.

The size of the national sample, for example, is such that estimates in greater geographic detail than planned cannot be made without enlarging the sample for that purpose. Moreover, the sample cannot provide independent information concerning persons in small groups of the population or for diseases of low frequency.

Further, there are limitations to the accuracy of diagnostic information collected in household interviews. The household respondent, at best, can pass on to the interviewer only the information the physician has given to the family. For conditions not medically attended, diagnostic information is often no more than a description of symptoms. Facts concerning the circumstances of the illness or injury and the resulting action taken by the individual, such as going to bed or seeing a physician, can be obtained more accurately from household members than from any other source. However, when clinical detail or diagnoses for unattended or nonmanifest illness are required, information procured by interview does not substitute for a medical examination. For this reason, information collected in the special studies, for example, by physical examinations and clinical tests, will supplement the results from the household survey.

The statistics from the program will not provide critical tests of clinical and epidemiological hypotheses. For example, the program could not test the hypothesis that a specific vaccine would prevent a certain disease. For this, an experimental design, a control group, and similar conditions would be required. The program may, however, suggest hypotheses that can be tested by other appropriate means. Information that is required quickly for corrective action, as in an epidemic, will have to come from other sources, such as the notifiable disease reporting system.

The program is intended to supplement existing sources of information and provide a background of broadly based illness statistics. It does not purport to replace the many ad hoc studies now being conducted.

Aside from such limitations as these, imposed by the methods to be used and the resources available, the program is free to collect any statistics on the incidence, prevalence, or other measures of disease, injury, or impairment, the disability or other effects of this morbidity, and the medical care used in its treatment. The sole guide is the usefulness of the data.

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# Supply, Distribution, and Use of Poliomyelitis Vaccine

By JACK C. HALDEMAN, M.D.

WITH THE ANNOUNCEMENT of the successful results of the 1954 field trials of Salk poliomyelitis vaccine, the way was opened to prevention and control of one more communicable disease.

The extraordinary progress achieved in this past year and a half in providing at least partial immunization to the most susceptible population is a tribute to the working partnership of the medical and pharmaceutical professions, local, State, and Federal governmental agencies, voluntary agencies, the drug manufacturers, and individual citizens. Together, they have labored diligently to insure the most equitable possible distribution and use of the limited amount of vaccine available.

The purpose of this article is to review the results of this cooperative effort and to outline the course that lies ahead for provision of maximum protection against poliomyelitis for the total population.

## Supply and Distribution

We are no longer faced with the problem of short supply of vaccine. The voluntary system of Federal allocation of vaccine, which was

adopted as the most equitable method for distribution of a scarce product, was terminated on August 1, 1956. Decontrol of vaccine was made possible by the following sequence of events.

Vaccine production had built up slowly through 1955 and the early months of 1956, but releases during April, May, and June brought the supply up to the demand level in a number of States. By July 27, 1956, more than 85 million cubic centimeters of vaccine had been released. Since there are approximately 65 million persons in the group most susceptible to poliomyelitis in this country (persons 0 through 19 years of age and expectant mothers), enough vaccine was now available to provide two injections for 70 percent of those eligible to receive it.

Because of State variations in immunization programs and the more plentiful supply of vaccine, a number of States did not request their shares of vaccine released during late June and July 1956. This necessitated reallocation of their shares to those areas of the country where demand still exceeded available supply. For these reasons, it was decided that the needs of all areas could best be met by releasing vaccine through normal distribution channels rather than through the Federal system of allocation to the States.

Since Federal decontrol of vaccine, an additional supply of more than 28¾ million cubic centimeters has been released. All parts of the country now appear to be able to get as much vaccine as they need.

Termination of the allocation system does not affect the allotment of Federal funds avail-

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*Dr. Haldeman is chief, Division of General Health Services, Bureau of State Services, Public Health Service, Washington, D. C. His paper is based on a talk he gave before the 25th annual meeting of the American Academy of Pediatrics, New York City, October 11, 1956. Figures have been revised as of November 15, 1956.*

able to the States for the purchase of poliomyelitis vaccine and the administration of public vaccination programs for children under 20 and expectant mothers. These funds, made possible by the Poliomyelitis Vaccination Assistance Act and amounting to \$53,600,000, will be available until June 1957. As of November 15, 1956, \$34,649,454 had been paid to the States and Territories.

### **Safety and Effectiveness**

The early confidence we had with respect to safety and effectiveness of the vaccine has been reinforced by experience in its use to date.

Since May 1955, when vaccine was first released under revised safety standards, there has been no epidemiological evidence that any case of poliomyelitis has been causally related to the use of poliomyelitis vaccine. This reassuring conclusion is drawn from the study of data in which each reported case of poliomyelitis is related to the lot number of vaccine used, date and site of injection, site of first paralysis, and dates of onset of the disease and of paralysis.

Epidemiological studies conducted by 22 States and New York City during the 1955 poliomyelitis season showed that the paralytic attack rate among the unvaccinated children was consistently higher than among the vaccinated. Further studies in 1955 revealed that only among 7- and 8-year-old children, those for whom the vaccine had been used almost exclusively that year, was there a sharp lowering of paralytic attack rates. Thus, the 1955 experience reaffirmed the confidence in poliomyelitis vaccine established by the 1954 field trials.

Because of a continuing higher rate of vaccination throughout the current poliomyelitis season, completely comparable studies, yielding quantitative estimates of vaccine effectiveness, will not be possible. Therefore, characteristics of the current incidence are being studied to determine any changes attributable to the vaccine. Preliminary reports from a number of States in 1956 revealed that vaccinated cases comprise a low proportion of the total paralytic cases. Furthermore, in every age group the proportion of cases that are paralytic is greater among nonvaccinated cases than among the vaccinated.

The weekly incidence of poliomyelitis for the current year (1956) has been running at a lower level than in any year since 1947. The number of cases reported so far this year is about half the past 5-year average. Except for the severe outbreak in Chicago, only Louisiana and Utah have reported high incidence. California reported moderate incidence. Occurrence in most of the remaining States has been exceedingly low. From the national incidence figures alone, it is not possible to attribute this entire decrease to the vaccine. However, the studies mentioned strongly support the conclusion that the reduction is at least partially due to the vaccine. If we can achieve a high level of vaccination coverage, we should be able to conquer poliomyelitis.

Although poliomyelitis vaccine is now being used throughout the country, there has been considerable discussion about the use of vaccine during the season of high incidence, particularly in areas where epidemic conditions prevail. This discussion centers around the balance between the benefits of vaccination and the quantitative importance of the provoking effect of vaccinations under such conditions. The ability of immunizing injections of diphtheria, pertussis, and tetanus antigens, and of therapeutic injections such as penicillin, to provoke paralytic poliomyelitis has been reported by several authors. Consequently, before it was tried, there was some concern that poliomyelitis vaccine used during an outbreak of disease might show a similar ability to provoke paralysis.

Poliomyelitis vaccine was first used in an epidemic situation at a naval base in Hawaii in the fall of 1955. Although analysis of this program did not firmly establish the effectiveness of the vaccine in controlling an epidemic, incidence was lower in the vaccinated population. Moreover, a thorough evaluation failed to demonstrate any evidence of a provoking effect of the vaccine. During the first month after initiation of the mass vaccination program, incidence rates were identical in the vaccinated and unvaccinated populations. In the highly exposed family contacts of demonstrated cases, incidence was again similar in the vaccinated and unvaccinated contacts. However, examination of the clinical character of the vaccinated

## *Prompt Use of Poliomyelitis Vaccine*

Secretary Folsom's report on the Salk poliomyelitis vaccine deserves the attention of every young adult, of every parent, in America.

The supply of vaccine is now plentiful.

I join with Secretary Folsom, the Surgeon General of the Public Health Service, and the National Foundation for Infantile Paralysis in urging that the vaccine be used promptly before the next poliomyelitis season arrives.

DWIGHT D. EISENHOWER

*President of the United States*

*November 28, 1956*

### *Opportunity Ahead*

Knowing of your interest in the poliomyelitis vaccination program I am making this report on developments to date and on a great opportunity which lies ahead.

Millions of children who have so far received only 1 or 2 injections should, before next summer, be given the additional protection provided by the recommended 3 doses. The full benefit of the vaccine is achieved only with 3 injections.

Millions of young adults, as well as children who have had no vaccine at all so far, should now begin their vaccinations in order to receive the full three doses before next summer's peak of poliomyelitis incidence. All States have now made commercial supplies of the vaccine available to adults.

Prompt use of the vaccine—this is our problem and opportunity now. And this will require the earnest and vigorous cooperation of parents, physicians, schools, officials at all levels of government, and public and private health agencies.

Through prompt use of increasing supplies of vaccine, the Nation can go a long way, next year, toward elimination of this dread disease.

The National Foundation for Infantile Paralysis has recognized the need for prompt action and is presently engaged in a vigorous campaign to urge that all unite in this cause—the cause of preventing needless illness.

Since the vaccine was approved for public use—some 18 months ago—about 115 million cc's, or doses, have been released by the Public Health Service. More than \$53 million in Federal funds have been made available to help pay for vaccine for children and expectant mothers.

The results have been extremely encouraging.

Surveys show that among children vaccinated with only one or two doses, the incidence of paralytic poliomyelitis has been reduced about 75 percent. We can expect an even greater reduction as more and more persons receive three injections.

I know you share my gratification at the great progress that has been made, and my hope that the people of the Nation will take full advantage of this opportunity to protect their children and themselves against the ravages of poliomyelitis.

—*From a report to the President,*  
by MARION B. FOLSOM, *Secretary*  
of Health, Education, and Welfare.

cases showed no predominance of paralytic disease, no concentration of cases 4 to 14 days after vaccination, nor any cases with first paralysis in the inoculated limb. In brief, the characteristics of provoked poliomyelitis were not present. Further, considering the extent of final paralysis in the paralytic cases which occurred within a month following vaccination, it was demonstrated that prior inoculation in an extremity did not increase the frequency of paralytic involvement of the extremity.

Thus, this report is reassuring because no measurable provoking effect could be found. But the study was based on only small numbers of cases.

The Chicago experience will provide an opportunity for further study of the use of vaccine during a serious outbreak—and on a larger population base. More than 1,000 cases of poliomyelitis occurred in Chicago in 1956, comprising more than 10 percent of the national incidence. Soon after the outbreak, a mass vaccination program was undertaken; more than a million doses of vaccine were given. The local health authorities, in cooperation with the Public Health Service, are intensively studying this outbreak. Particular emphasis is being given to evaluation of any evidence of a provoking effect. Although final conclusions cannot be drawn at this time, preliminary analyses have failed to reveal any such evidence so far.

#### Use of Vaccine

The amount of vaccine shipped into a State is a gross index of use since shipments are made only on bona fide orders which, for the most part, are promptly used.

In one State (Massachusetts) enough vaccine has been shipped to meet more than 65 percent of the total need for 3 injections for persons 0 through 19 years of age and expectant mothers; and in three more States (Illinois, Connecticut, and Utah) more than 50 percent. At the opposite end of the scale, less than 30 percent of the full amount needed has been shipped to 1 State and 1 Territory. Twenty-eight States and 3 Territories could meet between 40 and 50 percent of the need with the

vaccine already received, and 17 States and 2 Territories could meet between 30 and 40 percent. Of course, since many children and expectant mothers are not yet due for their third injections, these percentages are not indicative of the proportion of the priority group who have received some immunization. The figures do, however, indicate the dimensions of the job that remains to be done before the next poliomyelitis season.

Here, then, is the present challenge to the health profession, particularly to pediatricians, general practitioners, and public health physicians. This is still a new program as events in medical history are counted. Continuing educational efforts are required to impress parents with the importance of having their children immunized.

Several States are using some rather unique and interesting methods for stimulating an increase in the demand for vaccine. For example, the Mississippi State Board of Health employed 54 school teachers as "home visitors" for the summer to determine to what extent children in the families visited had been vaccinated and to inform the parents about the vaccination program and, particularly, where vaccinations could be obtained. This technique resulted in an immediate increase in immunizations both by physicians in private practice and by local health departments.

It is of interest to note that even though local health officials had extensively used radio, television, and newspaper publicity to announce the availability of the vaccine, the home visitors found that failure to take advantage of the program stemmed largely from ignorance of the availability of the vaccine or of the eligible age group.

Studies such as this help to pinpoint "soft spots" in educational campaigns, not only with respect to younger children under the supervision of pediatricians but also with respect to older children. The adolescent group is especially difficult to reach, falling in a sort of "never-never" land, too old to be seen regularly by the pediatrician and usually too young for regular visits to other medical practitioners. Perhaps the older siblings of the pediatrician's patients could be offered immunization

if they are not being reached by other arrangements.

Unquestionably, high school programs will be needed to "step up" vaccination of teen agers. With schools now in session, there will undoubtedly be more active vaccination programs for adolescents.

Pediatricians have an excellent opportunity to urge young parents to seek immunization for themselves as well as for their children. The incidence of poliomyelitis among young parents is also high, and the degree of paralysis severe, often with tragic socioeconomic consequences. As with the adolescent group, very little preventive medicine is being practiced among these young adults since they have not yet reached the age where they are likely to be reporting regularly to a physician for physical checkups or for treatment of a chronic illness or disability.

#### **Laboratory Diagnosis of Poliomyelitis**

Relatively recent findings, which indicate that many diseases masquerade as poliomyelitis, have made physicians increasingly aware of the difficulty of diagnosing true poliomyelitis. It is now generally recognized that nonparalytic cases cannot be accurately diagnosed without laboratory tests. There is growing evidence that laboratory tests are equally important in diagnosing some paralytic cases.

The development of the poliomyelitis vaccine intensifies the need for laboratory confirmation of all cases of poliomyelitis and polio-like diseases. With widespread vaccination, the ratio of polio-like diseases to true poliomyelitis can be expected to increase. Also, the vaccine itself may modify the course of the disease, thus making the diagnosis on purely clinical grounds correspondingly more difficult. Furthermore,

if an accurate evaluation is to be made of the total and long-range effect of the vaccine, it is essential to identify, by laboratory testing, the type of poliomyelitis virus involved for all reported cases.

To provide such testing, a network of laboratories, especially equipped to analyze specimens taken from patients with poliomyelitis or polio-like diseases, has been organized by the Communicable Disease Center of the Public Health Service. The network includes a number of academic research laboratories and State health department laboratories.

Physicians are urged to use these facilities by sending specimens to their State health department or to whatever laboratory the department designates. Full cooperation by all physicians will not only aid in obtaining more accurate diagnoses but will also promote research and make possible a continuing evaluation of the effectiveness of the poliomyelitis vaccine.

#### **Conclusion**

In conclusion, the job immediately ahead is to continue immunizing as high a proportion of the susceptible population as possible. This will require the unrelenting effort of both physicians in private practice and members of the public health profession. Once a high level of protection has been attained, holding it over the years becomes our mutual objective. Unless this is done, sporadic outbreaks will continue to recur, as has been clearly demonstrated in the history of diphtheria control.

No group has a more important role in achieving full protection against poliomyelitis than the pediatricians of this country. More mothers are taking their children to pediatricians than ever before. Taking full advantage of this opportunity is a real challenge.

# Mental Patient Data for Fiscal Year 1956

ON THE BASIS of summary data submitted to the National Institute of Mental Health of the Public Health Service by the various State and county mental hospital systems for fiscal year 1956, all categories show increases over the year 1955 except resident patients at the end of the year. This category shows a decrease on a national level for the second time in the history of the collection of such data. On the first such occasion, in 1943, there was a decrease of 0.3 percent.

Item	1955	1956	Percent- age in- crease
First admissions--	122,394	126,510	3.4
Readmissions-----	55,626	59,521	7.0
Discharges-----	119,146	134,702	13.1
Deaths in hospital--	44,400	48,478	9.2
Resident patients at end of year--	559,281	552,186	-1.3
Personnel em- ployed full time at end of year--	145,462	152,439	4.8
Maintenance expenditures:			
Total-----	\$618,229,797	\$662,146,372	7.1
Per patient---	\$1,112.84	\$1,190.32	7.0

Figures shown for 1955 will not agree with those in the comparable report for 1955 (*Public Health Reports*, March 1956, pp. 214-215) since they are based chiefly on data submitted for the 1955 annual census of mental patients and, with the exception of two States, do not represent estimates.

Public mental hospitals were asked, on recommendation of mental hospital statisticians in their fifth annual conference, May 1955, to provide certain basic figures after the close of each year: first admissions, read-

missions, total discharges from the hospitals, and deaths in the hospitals during the year; average daily resident population; resident patients and total personnel employed full time at the end of the year; and total maintenance expenditures for patients (*Public Health Reports*, September 1955, pp. 905-909).

The National Institute of Mental Health made this survey in August 1956. It was realized that final and complete data might not be available because of variation in reporting procedures and fiscal year ending dates. Therefore, the hospitals were requested, if the answers to any or all of the items were unknown at the time of the survey, to enter their best estimates.

Reporting is complete for all hospitals queried. However, one county hospital in Tennessee could not supply financial data. The National Institute of Mental Health estimated maintenance expense for this hospital by applying the per patient maintenance expenditure for 1955 to the average daily number of resident patients reported for 1956. No other estimates were made by the institute.

It is interesting to note that in 1955, even though the survey was conducted one month later than in 1956, nine States were unable to report complete data whereas complete reporting was obtained for 1956. The estimates published for the 1955 survey compare closely with the final data for 1955 presented in the table. The percentage error in the estimates for each category follows: first admissions +1.1 percent; readmissions, -0.8 percent; discharges, -0.5 percent; deaths, +0.2 percent; resident patients, +0.2 percent; personnel, -0.3 percent; total maintenance expenditures, +0.7 percent and per patient expenditures +0.6 percent. In view of these small differences and the fact that all data for 1956 were supplied by the States, it is likely that these 1956 data are very close approximations to the final figures which will be available at a later date.

*Prepared by the Hospital Reports and Records Unit, Current Reports Section, Biometrics Branch, National Institute of Mental Health, Public Health Service, Bethesda, Md.*

**Movement and administrative data for public mental hospitals: United States and each State,  
fiscal year 1956**

State	First admissions	Readmissions	Discharges	Deaths in hospital	Resident patients end of year	Average daily resident patient population	Total full-time personnel, end of year	Maintenance expenditures	
								Total	Per patient <sup>1</sup>
Totals.....	126, 510	59, 521	134, 702	48, 478	552, 186	556, 276	152, 439	\$662, 146, 372	\$1, 190. 32
Alabama.....	1, 581	713	1, 581	438	7, 277	7, 320	1, 342	5, 693, 330	777. 78
Arizona.....	748	314	962	151	1, 639	1, 670	495	2, 202, 551	1, 318. 89
Arkansas.....	1, 400	741	1, 713	364	4, 958	4, 957	1, 368	4, 703, 446	948. 85
California.....	12, 354	5, 915	15, 031	2, 800	37, 390	37, 002	10, 081	51, 389, 599	1, 388. 83
Colorado.....	1, 638	382	1, 384	605	5, 628	5, 696	1, 950	7, 861, 325	1, 380. 15
Connecticut.....	2, 333	1, 863	4, 125	1, 035	8, 535	8, 668	3, 178	14, 983, 055	1, 728. 55
Delaware.....	654	329	841	216	1, 706	1, 733	699	2, 581, 394	1, 489. 55
Dist. of Columbia.....	1, 055	272	884	600	6, 896	7, 120	2, 734	14, 327, 083	2, 012. 23
Florida.....	1, 481	403	1, 093	556	8, 069	8, 035	2, 163	7, 438, 657	925. 78
Georgia.....	2, 678	705	2, 399	934	11, 844	11, 738	1, 991	11, 956, 268	1, 018. 59
Idaho.....	652	374	820	149	1, 188	1, 227	339	1, 422, 849	1, 159. 62
Illinois.....	8, 465	6, 150	10, 493	3, 822	37, 885	38, 176	8, 983	41, 161, 600	1, 078. 21
Indiana.....	2, 609	1, 171	2, 570	939	10, 890	10, 996	3, 905	15, 410, 584	1, 401. 47
Iowa.....	1, 573	1, 304	2, 447	688	5, 039	5, 169	1, 857	6, 873, 078	1, 329. 67
Kansas.....	1, 195	503	1, 438	279	4, 394	4, 427	2, 170	7, 430, 543	1, 678. 46
Kentucky.....	1, 482	1, 248	2, 144	734	7, 272	7, 490	1, 610	5, 661, 448	755. 87
Louisiana.....	2, 204	695	2, 418	450	8, 270	8, 262	1, 992	6, 268, 343	758. 70
Maine.....	621	287	589	264	2, 981	3, 004	876	3, 424, 602	1, 140. 01
Maryland.....	3, 124	1, 165	3, 228	767	9, 688	9, 669	2, 901	12, 196, 749	1, 261. 43
Massachusetts.....	6, 044	1, 809	6, 514	2, 195	22, 202	22, 849	7, 093	31, 933, 633	1, 397. 59
Michigan.....	3, 333	1, 621	2, 869	1, 561	21, 482	21, 860	6, 584	34, 571, 518	1, 581. 50
Minnesota.....	2, 529	2, 118	3, 518	1, 130	11, 356	11, 430	2, 901	12, 573, 653	1, 100. 06
Mississippi.....	1, 749	1, 069	2, 456	422	5, 356	5, 228	1, 409	3, 900, 771	746. 13
Missouri.....	1, 327	535	1, 348	711	11, 753	11, 912	3, 167	12, 341, 466	1, 036. 05
Montana.....	682	234	674	214	1, 860	1, 905	516	2, 138, 411	1, 122. 53
Nebraska.....	1, 102	628	1, 357	448	4, 756	4, 741	2, 073	6, 571, 342	1, 386. 07
Nevada.....	196	35	211	30	439	446	91	536, 814	1, 203. 62
New Hampshire.....	681	247	674	313	2, 600	2, 667	901	3, 726, 568	1, 397. 29
New Jersey.....	5, 519	2, 240	5, 364	2, 548	21, 991	22, 013	7, 474	31, 216, 016	1, 418. 07
New Mexico.....	433	87	280	103	969	997	427	1, 582, 646	1, 587. 41
New York.....	16, 108	5, 778	11, 122	8, 661	96, 212	96, 768	25, 674	121, 677, 784	1, 257. 42
North Carolina.....	2, 341	1, 213	2, 992	518	9, 794	9, 890	2, 825	10, 583, 939	1, 070. 17
North Dakota.....	635	271	686	159	1, 886	1, 923	518	2, 025, 722	1, 053. 42
Ohio.....	7, 480	3, 367	8, 408	2, 326	28, 057	28, 344	7, 834	33, 347, 711	1, 176. 54
Oklahoma.....	1, 371	888	1, 541	577	7, 835	7, 897	2, 080	7, 110, 393	900. 39
Oregon.....	1, 971	1, 039	2, 072	540	4, 980	4, 956	1, 409	5, 341, 377	1, 077. 76
Pennsylvania.....	5, 119	2, 115	3, 923	3, 308	39, 947	40, 405	11, 275	45, 182, 617	1, 118. 24
Rhode Island.....	952	539	985	451	3, 402	3, 414	844	3, 304, 549	967. 94
South Carolina.....	1, 781	562	1, 736	455	6, 199	6, 113	1, 381	5, 007, 600	819. 17
South Dakota.....	508	242	571	169	1, 613	1, 604	451	1, 899, 501	1, 184. 23
Tennessee.....	2, 103	1, 200	2, 805	613	8, 170	8, 303	1, 311	5, 569, 175	670. 74
Texas.....	4, 532	1, 868	5, 711	1, 239	15, 937	16, 150	3, 180	12, 215, 711	756. 39
Utah.....	340	112	229	109	1, 280	1, 303	430	1, 156, 319	887. 43
Vermont.....	387	170	438	147	1, 234	1, 281	337	1, 516, 693	1, 183. 99
Virginia.....	2, 301	1, 528	3, 005	1, 024	11, 037	11, 134	2, 540	10, 698, 331	960. 87
Washington.....	1, 418	910	1, 751	642	7, 152	7, 217	2, 232	8, 166, 238	1, 131. 53
West Virginia.....	1, 877	979	1, 880	492	5, 404	5, 486	1, 045	3, 794, 642	691. 70
Wisconsin.....	3, 675	1, 485	3, 225	1, 507	15, 084	15, 029	3, 643	18, 668, 582	1, 242. 17
Wyoming.....	169	98	197	75	650	652	160	800, 146	1, 227. 22

<sup>1</sup> Per patient maintenance expenditure was computed by dividing total maintenance expenditure by the average daily resident patient population in each State.

NOTE: These data are provisional and subject to change. Public hospitals include the State and county hospitals for mental disease and the psychopathic hospitals.

# A Survey of Chiropteran Rabies in Western Montana

By J. FREDERICK BELL, M.D., W. J. HADLOW, D.V.M., and WILLIAM L. JELLISON, Ph.D.

IN an earlier report from the Rocky Mountain Laboratory of the Public Health Service, Hamilton, Mont., we described the isolation of rabies virus from a bat caught in Ravalli County, Mont., in the late summer of 1954 (1). The lateness of the season limited collections in that year. However, in 1955 we made further attempts to isolate rabies virus from the bats obtained during field trips and by contributions from local residents.

Usually, bats were collected from roosts in attics with the gloved hand or were taken with forceps. Several infected bats were collected under circumstances which we will describe.

In the laboratory one lateral half of the brain of each bat was triturated in sufficient 1 percent albumin-saline diluent to make approximately a 5 percent suspension. A preliminary test for infection was done with each suspension by injecting each of 6 mice intracerebrally with 0.03 ml., and the remainder of the suspension was frozen. When the screen test was positive, the preserved suspension was centrifuged, and the supernate was titrated in mice. The other

half of the brain was fixed in Zenker's fluid for microscopic study.

## Rabies From Three Species

One hundred twenty-one apparently normal bats were collected alive in routine collections in various parts of Ravalli County. The numbers of the various species examined are tabulated:

<i>Myotis yumanensis</i> .....	14
<i>Myotis lucifugus</i> .....	47
<i>Myotis yumanensis</i> or <i>Myotis lucifugus</i> (juvenile).....	17
<i>Myotis volans</i> .....	3
<i>Myotis evotis</i> .....	1
<i>Myotis californicus</i> .....	1
<i>Eptesicus fuscus</i> .....	37
Unidentified.....	1

These bats were brought to the laboratory and held in captivity a day or two until it was convenient to test them. None of their brain tissues produced rabies in mice.

Six other bats exhibiting aberrant behavior or found in unusual situations by people who knew of our 1954 findings were submitted for examination. Three of the six bats were rabid. The circumstances under which these three bats were collected are as follows:

A housewife in a small town about 6 miles from the laboratory brought the first infected bat, *Myotis californicus californicus*, to our attention. She said that her dog had bitten a sick bat, which was dead when a messenger arrived to collect it. The dog remained well during a 3-week period of observation.

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*The authors are, respectively, senior surgeon, pathologist, and parasitologist with the Rocky Mountain Laboratory, National Institute of Allergy and Infectious Diseases, Public Health Service, Hamilton, Mont. Dr. Charles O. Handley, Jr., of the Division of Mammals, United States National Museum, Washington, D. C., identified all the bats examined. The museum retained the infected specimens for reference purposes.*

In western North America, the California little brown bat, *M. californicus*, is represented by four subspecies, which range from southern Alaska to southern Mexico. *M. californicus* is a small insectivorous bat of uncommon occurrence. Hall (2) found the species in Nevada hibernating in mine tunnels. Little is known of its habits or its distribution in Montana.

The second infected bat, identified as *Eptesicus fuscus pallidus*, was collected alive by a 10-year-old boy, who found it along with a dead bat on the floor of an unoccupied house in Hamilton. He adopted the bat as a pet, but the next day it died. When the child brought the dead animal to the laboratory, he was questioned carefully but denied having been bitten.

Information on *E. fuscus pallidus* is included in our 1955 report on chiropteran rabies (1).

The third infected bat, *Lasiurus cinereus cinereus*, was collected by one of us at Flathead Lake in northwestern Montana. As he was standing near the shore of the lake in open pine woods in bright daylight (6 p. m., August 18, 1955), his attention was attracted to a fluttering bat overhead. The bat flew in a direct line toward a large tree, which it struck without slackening flight. The animal fell to the ground, but it was conscious and squeaked when approached. He killed the bat with a light stick and kept it in a frozen food locker until it was taken to the laboratory.

The hoary bat, *L. cinereus cinereus*, is the largest of the bats found in the Pacific Northwest, but it is also a rather rare species. Its range includes almost the entire United States and southern Canada and northern Mexico. Davis (3) has recorded only a single specimen from Idaho. Dalquist (4), who mapped only seven collection records for the species in Wash-

**Table 2. Characteristics of rabies virus after serial passage in mice**

Bat virus No.	Mouse brain passage	Incubation period <sup>1</sup> (days)	Titer of virus <sup>2</sup>	Mouse brain passage	Incubation period <sup>1</sup> (days)	Titer of virus <sup>2</sup>
1-----	1st --	6	4.4	3d---	7	3.0
2-----	1st --	18	3.4	5th--	7	4.5
3-----	1st --	7	4.8	8th--	8	4.5

<sup>1</sup> Ten percent suspension injected.

<sup>2</sup> Log of the number of LD<sub>50</sub> per 0.03 ml. of brain tissue.

ington, states that information on the natural history of the hoary bat is meager. He further states that the hoary bat is migratory and leaves Washington in August and September to winter along the coast of central and southern California. Although *L. cinereus cinereus* is largely a forest-dwelling species, Durrant (5) writes, "I have taken specimens by shooting over desert water holes."

Some characteristics of the three isolates of rabies virus are noted in tables 1 and 2.

Although Negri bodies were found in microscopic sections of the brain of each of the three bats (table 2), there was no evidence of inflammatory changes in the material available for study. Negri bodies were most numerous in the single specimens of *E. fuscus pallidus* and *L. cinereus cinereus*. Both Negri bodies and inflammatory lesions were found in the brains of first-passage mice. Titers of virus and incubation periods in first and subsequent mouse-brain passages are shown in table 2.

Rabies antiserum was prepared in this laboratory with the National Institutes of Health-Pasteur strain PV-1 as an antigen. The serum was used in neutralization tests against the PV-1 virus, the rabies virus isolated in our 1954 bat studies, and the three strains isolated in this study. As a control, the serum was also used against a virus isolated by Dr. Harald Johnson from a bat and known not to be rabies. The serum neutralized all viruses to titer except the one obtained from Dr. Johnson. There was no evidence of reaction with the latter virus.

#### Discussion and Summary

Three of the 127 bats, comprising 7 species, collected in western Montana for the Rocky

**Table 1. Characteristics of rabies virus isolated from three naturally infected bats**

Bat virus No.	Negri bodies in brain of bat	Negri bodies in first mouse passage	Incubation period (days)	Titer of virus <sup>1</sup>
1-----	Present----	Present----	9	4.0
2-----	Present----	Present----	10	6.1
3-----	Present----	Present----	9	3.6

<sup>1</sup> Log of the number of LD<sub>50</sub> per 0.03 ml. of brain tissue.

Mountain Laboratory of the Public Health Service, were found to be infected with rabies virus. The infected bats were *Myotis californicus californicus*, *Eptesicus fuscus pallidus*, and *Lasiurus cinereus cinereus*.

It is noteworthy that none of 121 bats collected while roosting were infected whereas 3 of 6 bats that exhibited abnormal behavior had rabies. The titers of virus in the brains of mice infected with the 3 strains were rather low and remained low even after several passages. Stamm and his associates (6) found the same to be true of one Florida bat strain. The three isolations from bats were the only isolations of rabies virus in Montana in 1955.

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### FDA Renews Hoxsey Warning

The Food and Drug Administration is intensifying its efforts to warn cancer patients and their families against the Hoxsey treatment for internal cancer. Help in disseminating the official United States Government warning is sought to offset increased promotion of the "treatment" launched following an adverse ruling against the Hoxsey clinic at Portage, Pa.

Information has been received that additional Hoxsey clinics are planned in other States. Hoxsey supporters are soliciting funds to "pay expenses" and "fight the medical trust."

On November 15, 1956, a Federal court jury at Pittsburgh sustained FDA charges that a half million pills seized at the Portage clinic were misbranded because they are of no value in the treatment of cancer. During the 6-week trial 80 witnesses, including some of the world's outstanding cancer experts, testified for the Government. Their evidence showed that persons claimed to have been cured by the Hoxsey medicines have since died of cancer; that others did not have cancer at all, while

still others were effectively treated by X-ray or surgery before taking the Hoxsey treatment. It was indicated that some users may have died of cancer because they relied on the Hoxsey treatment instead of seeking competent medical care in the early stages of the disease.

For more than 30 years Harry M. Hoxsey has made false claims for his liquid medicines and pills, and thousands of users have been deceived in spite of numerous local and State court actions.

Following the official public warning last April, FDA inspectors reported a very substantial decline in patients at the Portage, Pa., and Dallas, Tex., clinics. During the ensuing 7 months an estimated 3,000 to 6,000 persons were dissuaded from patronizing the clinics.

Copies of the FDA public warning may be obtained by writing to the Food and Drug Administration, Washington 25, D. C. A shorter public notice is also available for use in local newspapers, shopping news, farm, fraternal, and religious publications, or as a basis for radio or TV announcements.

# *The State of the Nation's*

public  
health  
services

**Abridged reports from the 55th Conference of the Surgeon General of the Public Health Service and the Chief of the Children's Bureau with the Association of State and Territorial Health Officers, the State Mental Health Authorities, and the State Hospital and Medical Facilities Survey and Construction Authorities, November 2-10, 1956, Washington, D. C.**

## **New Highways To Health**

**By Leroy E. Burney, M.D.  
Surgeon General of the  
Public Health Service**

Would that we health experts had the same precise knowledge in our field as the Nation's highway planners. For without it, we cannot plan new highways to health which would extend through all the States at the same rate of progress and standards of quality, and which would, by the very boldness and imaginativeness of design, capture public support.

I am not suggesting that we don't know what's going on in our own shops. Few public services have made as conscientious and unceasing an effort as public health agencies to collect and analyze reliable data pertinent to their statutory responsibilities.

But most of the facts that we have at our fingertips relate to the organizational structures, types of services, and ratios of professional personnel and facilities for a population of some 130 million in the social, economic, and physical environment of 20 years ago. Let's take a look ahead.

We need facts pertinent to a population of some 168 million today, 180 million in 1965, and 200 million by 1980. We need to see our organizations, services, personnel, and facilities

*Continued on page 21*

## Federal-State Cooperation: 1903-1956

The evolution of the Surgeon General's Conference with the State and Territorial health officers illustrates the durability of Federal-State cooperation in an ever-changing field. We are fortunate that Federal-State cooperation has been the usual order of business in public health for so long. This conference, established by law in 1902, antedates the provision of any regular mechanism for Federal-State cooperative planning and action in other matters of civil policy. It is still unique in that it is the only instance in which the entire body of State and Federal officials in a given field work together under law in an organized way.

Amendments to the Social Security Act later established an annual conference of the Chief of the Children's Bureau with the State and Territorial health officers. Then in 1946, the Public Health Service Act of 1944 was amended to require the Surgeon General to confer with State and Territorial hospital and mental health authorities. Since that time, we have had a joint conference of the Public Health Service and the Children's Bureau.

The broadening of these conferences reflects more than the broadening interest of the Federal Government in health. It reflects the broadening responsibility of the States and the notable strengthening of State and Territorial health programs. It also reflects many underlying and striking changes in health needs.

Let us compare, briefly, the first conference, in June 1903, with the 55th conference. The first conference met only one day. Twenty-two States and the District of Columbia were represented. In his annual report to Congress, Surgeon General Walter Wyman said of this meeting: "The delegates in turn gave synopses of the laws under which their respective boards (of health) operate, and a resolution was adopted favoring the formation of committees on special diseases and special consideration of such questions relating to the same as might be referred to them by the Surgeon General."

Those committees were on the following topics: scientific research and sanitation; prevention and spread of epidemic diseases; morbidity and mortality statistics; State legislation; and education. Subcommittees were appointed to report on cholera, yellow fever, plague, smallpox, tuberculosis, leprosy, and typhoid fever. It was agreed that resolutions of

future conferences were to be based on committee reports.

Fundamentally, that procedure has not changed. But what a difference today in composition and major topics of interest. The health officers here represent the 48 States, Alaska, the District of Columbia, Hawaii, Puerto Rico, the Virgin Islands, and Guam. Most are accompanied by program directors in one or more of the following fields: hospital and medical facilities, mental health services, maternal and child health and crippled children's services.

Through the Association of State and Territorial Health Officers, 7 permanent standing committees and 3 special committees have been in session and will present recommendations to the Service, the Children's Bureau, or to the association. It is noteworthy that none of the committees is concerned with one specific disease. Our concerns today are focused on Federal-State relationships, on broad categories of services and facilities needed for better health, and on people—mothers and children, American Indians, and migrant workers.

You have only to glance at the volume of the agenda to realize that this is a year-round working conference. Our Federal-State communications system is much more efficient. For this, we owe thanks to the association, its executive committee, the regional staffs of the Service, and the Children's Bureau.

There is another change. At that first conference and many thereafter, the initiative clearly came from the Public Health Service. Today, more often than otherwise, the initiative comes from increasingly vigorous and aggressive State and Territorial health departments.

I do not relinquish thereby one iota of the Public Health Service's responsibility for aggressive leadership. But we have only to glance at the international news to realize that exclusive leadership is the loneliest, the most sterile, and the least permanent. It is because our country has joint leadership in public health—Federal-State cooperative leadership—that all of us can undertake our individual and collective responsibilities with confidence and hope.

*—Excerpts from the opening remarks of  
SURGEON GENERAL LEROY E. BURNEY.*

*Continued from page 19*

for this larger and increasing population in entirely new settings: A rising standard of living, new patterns of urban and suburban life, larger families, more older people. Increasing automation, with consequent shift in the types of occupation and conditions of work. Emergence of entirely new industries. More cars, more trucks, more planes. Atomic power, much sooner than imagined. Increasing costs of hospital services, coupled with increasingly effective diagnostic and therapeutic techniques in the hands of the practicing physician. Increasing numbers of individuals and families seeking, but not finding, new types of health services in their communities.

We have some general concept of the gaps in our health programs. But a gap is not the sole measure of deficiency. We need to identify the causes of obsolescence and seek earnestly to remove them. It is not good business or good public health practice to hold on to obsolete procedures and activities.

We should address ourselves to this kind of appraisal, agonizing though it may be to some professional groups in public health practice. Our shortages of professional personnel are indeed vast. But, in our preoccupation with the estimated needs and no relief in sight, we have almost convinced ourselves that only more of the same will correct the deficiencies of our programs. On the contrary, we have at least two good alternatives: more effective use of professional public health personnel and the employment of other specialists and subprofessional groups.

Over the past 24 years, the American Public Health Association has sought earnestly to raise the standard of educational qualifications for the numerous specialty groups that make up the public health profession. In practice, however, too many of those who meet the qualifications are kept on outmoded activities which make no demands on their hard-won skills, have no use for their creativity, their burgeoning ideas. Too many are burdened with routine administrative tasks for which they have not been, nor should have been, trained.

### **Liberating Creative Powers**

While pressing forward with every financial and educational resource at our disposal to in-

crease the supply of professional public health personnel, let us henceforth put a high priority on liberating the creative powers of our present and future staffs. Their ideas and imagination, tempered in the fire of meaningful experience, are what we need to design and build the new highways to health.

How then to remove the burden from overworked people who can't think, simply because there is no time to think? I have no ready answers to the question; no one individual can produce the best answers.

For what it's worth, however, try this on for size. If you had one or more specialists in public administration to share your burden of organizational and administrative planning and execution, or even enough administrative assistants to deal with the details of fiscal and budget matters, personnel administration, and so on, how much more time would you have to meditate? To meditate on the incalculable present and future problems in your area? To work and plan with your counterparts in State programs such as welfare, education, rehabilitation, housing, rural and industrial development? To consider with your fellow State health officers in nearby jurisdictions the urgent regional health problems of common concern?

We have made a little progress in accepting the idea of using less highly qualified nursing personnel as a means of conserving the skills of our scant supply of public health nurses. Clinic nurses and practical nurses are being employed in local health departments with increasing frequency. But, nationwide, we haven't employed nearly enough, or nearly enough clerks and clinic aides to allow public health nurses to serve the community as widely as they could if they did not also have to be record clerks, receptionists, and housekeepers.

Is there a possibility that all local health departments could benefit by the help of a volunteer group, something akin to the Gray Ladies of the American National Red Cross?

Perhaps some of the other health department programs, besides public health nursing, could use the services of volunteers. We are urging community surveys to get the facts upon which to base the needed modernizing of our programs. There are many jobs in community

surveys for specially trained and disciplined volunteers. They would never lack work to do in a local health department, I warrant.

In the same connection, can we use our personnel, facilities, and funds at the local level more efficiently by doing some of the essential jobs regionally and with more automation? Modern means of communication and our great new system of highways are leveling the road-blocks of time and distance. We should use these facilities to help break some of public health's traffic jams. I am thinking especially of local laboratory services and statistical programs. Perhaps we could have more specialists in local health services if we were willing to regionalize these activities.

Meantime, the Health Amendments Act of 1956, which became law (P. L. 911, 84th Cong.) on August 2, 1956, has made a good start toward increasing the supply of professional public health personnel, nurse educators, nursing supervisors and administrators, and practical nurses. By October 31, 32 schools of nursing and graduate schools of public health had applied for grants under title 1 of the act. The number of traineeships requested far exceeded our expectations, and even farther the resources, \$1 million, available for this year. For example, we have been able to approve only 130 of 276 traineeships in public health nursing requested by the nursing schools, and only 47 of the 84 traineeships requested by the schools of public health. In addition, the Service has awarded 89 individual traineeships.

In the program for the advanced training of professional nurses under title 2, we have proceeded along the same lines. The 1957 appropriation for this program is \$2 million; grants are made to schools only. By October 31, grants had been awarded to all 56 eligible schools, covering traineeships for 553 students. More than 400 traineeships requested could not be awarded for lack of funds.

The training program for practical nurses is administered by the Office of Education of the Department of Health, Education, and Welfare. Two million dollars has been appropriated for traineeships, which will be awarded in the form of grants to the States. For every \$1 made available by a State in its expanded practical nurse training program, the Federal Gov-

ernment will grant \$2 to provide traineeships, up to a total Federal expenditure of \$2 million this year. A commissioned nurse officer of the Public Health Service has been detailed to the Office of Education as a consultant in the practical nurse training program. A citizens advisory committee is being assembled to help in the administration of the program, and nursing consultants are being employed to aid in expanding enrollments in practical nursing schools.

These new Federal programs to help augment the supply of health personnel by no means reduce, but possibly increase, the needs for inservice training at every level—national, State, and local. The simplest types of inservice training are those concerned with the use of new techniques and new equipment. The application of the cytologic test for preinvasive cervical cancer is a case in point. So also is the use of air pollution detectors and a host of other new techniques which could be widely applied if more subprofessional personnel were trained to do those parts of the procedure within their competence.

At professional levels, broad orientation in certain new problem areas must be provided on the job or in regional short courses for staff members who completed their academic training before the information now available had been developed. I have in mind such fields as radiological health, up-to-date civil defense and disaster relief, and regional development.

### Understanding of Human Behavior

In all our tooling up to design new highways to health, we should recognize our public health profession's need for some orientation, some training in the behavioral sciences. The day will come soon when many State health departments will have a specialist or two from the fields of psychology and cultural anthropology on their permanent staffs or as frequently used consultants. The few that now have such specialists and we in the Federal agencies will learn to use their services more effectively. For it should be clear to all of us by now that the health programs of the future will lead nowhere if they are not based on a sounder understanding of human behavior than is af-

forded most of us by our good will toward man and our intuition.

The community is our field. Here we must demonstrate the value, and the very reason for being, of public health and preventive medicine, or we fail. And the community is not so many square miles of structures, so many sewer lines and water pipes, so many birth and death certificates and case reports. The community is people of all ages, of all sorts and conditions, and they all behave not only as individuals but as groups, bound in many and widening circles by common beliefs, attitudes, and needs.

We often draw an analogy between the role of the personal physician and the local health officer. We say that as the former is responsible for diagnosing and treating the individual patient, using the services of specialists when they are needed, so the latter bears a like responsibility to the community. If this be so, I would say the local health officer needs a consultant in behavioral science perhaps even before he begins to diagnose, and certainly before he institutes any form of therapy requiring the acceptance, consent, and action of any sizable part of the community. If some of you think I go too far along this line, there is a growing experience and literature to bolster my contentions. Take a look, for instance, at "Health, Culture, and Community," edited by Benjamin David Paul. You will find these studies, some drawn from our own American society, illuminating and stimulating.

## Medical and Related Research

That mention of studies reminds me that I have said nothing so far about medical and related research as a prerequisite to modernizing our highways to health. Perhaps this is because so much has already been said that some of us begin to think that all the basic and applied answers to our major health problems must be found before effective changes in services and programs can be made. We want, and must have, research and application going forward shoulder to shoulder.

Let me say that the Public Health Service will do everything in its power to promote and assist the development of research in, by, and with State and local health departments.

By and large, the findings of the past decade have found swifter, more widespread application in medical practice and hospital care than in public health programs. There is a special bridge that needs to be built to give us the needed shortcut. And that bridge is the kind of operational research that health departments are eminently suited to undertake. Actually, many of the questions I have been raising can be answered only by careful studies.

Also, our health departments must take a much more important part in epidemiological research than they have been taking. Some of you may recall Dr. Joseph Mountin's statement: "The health department is the only place a young physician can study healthy people along with the sick." The same could be said of the medical research scientist. The study of human biology and pathology in its natural setting, the human community, is indispensable. The principles of epidemiology have been developed and applied to parts of that essential study by public health scientists as their profession's unique contribution. Our major contemporary health problems present a challenge to epidemiology, no less than to experimental and clinical research. Our health departments should join with their scientific colleagues in taking up that challenge.

Besides the unquestioned additions such studies will make to public health knowledge and methodology, we shall realize untold benefits in removing one of the major causes of obsolescence in our health programs. And that is the isolation of many State and local health staffs from the stimulus of scientific inquiry and fruitful contacts with academic and research institutions. I see cooperative research, involving health departments with universities, or schools of public health, or medical schools, or the Public Health Service, as an aid to recruitment such as we have not had in years.

The few issues I have discussed by no means cover the gamut of problems we face together nor the victories we have shared. They have seemed to me especially important at this point in time, when the future strength and competence of our Federal, State, and local health departments seem especially vital to our Nation.

Someone has said that "ideas are the life of a people." The effective planning and develop-

ment of our health services is no less dependent on ideas. And at the present time of transition, no idea is too simple to be unworthy of a trial. We cannot build health highways by talking, but only by putting ideas to work. This means that top level health officials must be receptive to ideas, even to ideas that suggest the abandonment of obsolete procedures and activities, the development of new programs and methods of organization and staffing.

*NOTE: The full text of Dr. Burney's address included a section on aging that appeared in the December 1956 issue of Public Health Reports, p. 1168.*

## Training Mental Health Personnel

**By Robert H. Felix, M.D.**  
**Director, National Institute**  
**of Mental Health,**  
**Public Health Service**

The serious need for trained mental health manpower is one matter that necessarily occupies much of our time and energies. This area of concern was uppermost as long ago as 1946, when State and Territorial health officers and State mental health authorities met in joint session for the first time in the history of the Public Health Service. We have struggled with the problem in the ensuing 11 years, and today it is still with us in greater proportions than ever before, in spite of the thousands of people who have been trained, because mental health activities on all levels are increasing.

The requirements for more trained people are evident in all parts of the Nation. Some specific information on the situation in one section of the country with regard to one class of personnel will help pinpoint the problem. I am referring to the data on the resources and needs in the 16 southern States, provided by the survey conducted in 1954 by the Southern Regional Education Board. The survey findings resulted in the estimate that the south needs 4,260 psychiatrists for all purposes, or more than 5 times the number it has now. The

shortages of other workers are equally acute: 7 times as many clinical psychologists, 5 times as many psychiatric social workers, and upward of 5 times more psychiatric nurses than are available.

A closer look at the survey findings reveals that only 272 psychiatrists were expected to be trained in the entire south during the 3 years following the study. In other words, the south in 1957 will still be faced with a shortage of about 4,000 psychiatrists. At that rate of training, it would take many years to obtain the needed psychiatrists, and in the meantime the number required undoubtedly would increase considerably.

The comprehensive survey of the Southern Regional Education Board took into account the personnel required for public programs at all levels, as well as those for private practice and for training-center faculties. We have looked around us, and we know that, while the training centers and the urban areas have their problems with regard to shortages of personnel, they are relatively in a much better position than are other programs. By far the greatest number of staff vacancies exists in State programs, in the community mental health clinics, and in the mental hospitals. The teaching center, for example, may need only an additional man or two to round out its program. Many operating programs, on the other hand, may need one or more professional mental health personnel to initiate activities or to replace its part-time activities with full-time services.

Far too many mental hospitals are struggling along with grossly inadequate staffs. We estimate that the hospitals have only about one-half the number of psychiatrists they should have to provide adequate treatment for the patients under their care. The deficit of nurses, psychologists, and social workers is even greater.

### Grants Program of Institute

The support and encouragement of training has been a vital phase of the National Institute of Mental Health's activities. Our approach has necessarily stressed support for the existing centers of learning. At the same time we have tried to stimulate the development of additional

training centers where it appeared that need existed. The universities and the teaching centers historically have served as bases for training people. At the outset, we found these centers, as a whole, needed improvement, both financially and programwise. Accordingly, the institute gave high priority to grants for this purpose.

The grants program was initiated in 1947. In the years since, the institute has made grants to medical schools to improve or expand psychiatric instruction to the medical student. During fiscal 1956 alone, grants were awarded to 72 of the Nation's 84 medical schools. This aid means that 26,000 of the total 28,000 medical school students will receive more and better psychiatric instruction, to enable them to deal more effectively with the emotional problems of their patients.

Grants in another area have been directly responsible for the inauguration of mental health curriculums in 6 of the 10 schools of public health. Moreover, teaching centers for psychologists, psychiatric social workers, and psychiatric nurses have come in for their share of grants from the institute. Another technique sponsored by the institute to encourage well-rounded training is the series of regional conferences for professors of psychiatry in medical schools in the west and the south.

About 4,000 individuals have received stipend support for training during the 10 years the grants program has been operating. During fiscal 1957, 440 training grants, including 1,800 stipends, will have been made.

This, admittedly in brief, is the picture of support for mental health training at the national level. All of us, I think, can be justly proud of the progress and the accomplishments to date. At the same time, all of us know that the numbers already trained do not nearly approach the total need. The institute has never felt that it could or should singlehandedly take care of the vast training needs for the entire Nation.

The responsibility is a joint concern. It seems that the States recognized and acted on their training obligations a few years ago to a greater extent than they do today. In 1948, in the early days of the grants to State programs for mental health, the record shows that

the States used no less than 14 percent of available funds for preservice training of personnel. But in 1955, only 2 percent of State funds were spent for this purpose. In actual dollars, State expenditures dropped from \$840,000 in 1948 to \$360,000 in 1955.

One conclusion to be drawn from these figures is that the States' outlays for training in recent years are negligible amounts when compared with 1948 records. Less and less money is being spent by the States for training people in spite of the fact that the need to give services has skyrocketed. The demands for services everywhere grow greater, mental health centers are planned and funds for personnel are available, but the mental health workers are not to be found at any price.

### Need for Trained Workers

I appreciate the constant and continuing pressures you face. But we must keep training in proper perspective. When many of the State programs were getting started, people were trained because they were a sheer necessity. Without the trained workers, programs could not develop beyond a certain point. There are limits to how far workers can be stretched to cope with community mental health needs. For the improved programs the public is demanding, more and not fewer workers must be trained.

We can begin to come to grips with the need for trained workers by looking at the training centers and the areas which more nearly approach their manpower needs. What is it about certain training centers that attracts residents and well-prepared faculty members? Location of the center is high on the list of desirable characteristics. The individual should have access to adequate and ample reference material. He has opportunities for professional growth through participation in research, for work and contact with influential teachers in many fields of learning. The element of prestige in such an environment cannot be overlooked. The trainee's or the faculty member's working conditions are much more satisfactory. He has smaller patient loads, with all that this implies for adequate supervision. Time off for clinical work and for supervision in special

areas can usually be arranged. If he wishes, the individual may branch out into fields other than his own, and the total environment provides stimulating intellectual contacts.

Obviously, then, the answer to some of our manpower problems lies in bridging the gap between the training center and the State programs. Is it possible to initiate developments designed to create some of the same advantages the training centers have? You can do all in your power to influence the location of proposed new hospitals near universities. You can work to set up research units within your hospitals. Faculty arrangements and exchanges between universities and hospitals and mental health centers can be worked out. From time to time, opportunity can be given staff of these installations to take additional work at the university or under faculty supervision. Seminars can be arranged through the training centers and authorities from outside the State can be brought in periodically.

There is considerable advantage, both to the individual and to the program, for continuation of training on the job or on an intermittent basis after the period of formal preparation is completed. Professionals in the mental health field are usually trained in psychiatry, psychology, public health, social work, or nursing. Usually, these people come to the job as representatives and protagonists of their particular discipline, and with all of the biases and narrowness such training usually produces. What is needed in mental health work is not a collection of specialists brought together to practice their professions but rather a staff who bring a variety of skills which, taken together in proper proportions, will be much more likely to result in the best solutions. Unfortunately, this attitude is rarely developed in a training center, but the need for this point of view usually becomes apparent rather quickly once the worker begins to apply his training on the job. With the realization of this need, there is motivation for a broader and more useful type of training. When opportunity is provided to meet this need, one can look forward to a much better integrated and useful staff.

In addition to the advantages, inservice training has a byproduct which may be more valuable for the future than the original purpose of

providing better preparation for people already employed. The training centers are brought to realize wherein they are falling short in preparing their students, and with continued pressure applied by the students and the agencies which employ them, it is much more likely that the centers will provide the needed training either in the regular curriculum or in special courses.

It seems that these are activities in which States and communities can properly and profitably invest money and energy.

### Community Health Work

How are we going to get people to take training, and also, how do we obtain the necessary qualified people to do the training? The motivations, of course, are not necessarily the same in all disciplines within the mental health field. Also involved are the clinics and hospitals and whether they are motivated to provide adequate and acceptable training, or, if unable to do this, to provide training in certain areas which can better be obtained there than elsewhere. We must recognize that the hospital which is far removed from the training center may not be able to obtain many new residents in psychiatry, for instance; but, while the institution may not be able to provide all a student's necessary training, it may well be ideal for providing experience and supervision in special segments.

Where an institution carries on an active program of research in special areas, it can often develop a rather wide reputation, and if this program is really excellent, there will be demand for opportunities to spend some time there. Some such special areas are aging, mental retardation, alcoholism, rehabilitation programs, programs with the schools, and closely integrated hospital and community programs.

This is what is actually happening in some places where State and community hospitals and extramural programs are integrated with training centers. There are numerous possibilities to obtain training in a variety of settings. Students, for example, may wish to obtain some supervised experience in the penal system or in another type of institution such as the juvenile court although they might balk at spending the entire training period there.

The system of associated psychiatric faculties is employed to facilitate this integration of learning centers, hospitals, clinics, and other agencies for training. In many cases, the institution's staff helps out with didactic instruction in the training center's program.

The varied background which this kind of training provides is the kind of orientation State and community mental health personnel need. I wish I could report that all of our young people are receiving this kind of training, but we know all too well that they are not. Indeed, I am amazed and surprised at the vast differences in training one observes in one institution or another. Trainees in psychiatry, for instance, may be quite effective in working with psychotic patients but know little or nothing about working with schools and community agencies.

I am not, of course, opposed to highly specialized psychiatrists or other workers. We need this kind of personnel also. I am saying, however, that training is not equipping many people to do the community mental health work they have chosen. Their formal training does not give them the experience for the problems they inevitably meet. The omissions in instruction are understandable when we consider that some teachers are themselves handicapped in the same way. They, of course, pass their blind spots on to their students.

Both the trainee and the teacher, then, need a knowledge of the community's organizations and its institutions. I cannot help wondering how many psychiatrists have started careers in clinics, for example, only to become uncomfortable at finding themselves unprepared, and have turned to private practice instead. Integration of institution staffs and the training center faculties is one remedy for this situation, and each group will derive help from the other.

## Regional Network

The States can derive tremendous benefits from such cooperation. I can think of one State hospital which until recently was a fairly typical mental institution, short of staff, training programs, and research projects. Now it has more applications for residencies than it has vacancies. The reason for this brightened pic-

ture is participation in a training network that embraces the State university, a good clinic, a Veterans Administration hospital, and other agencies.

Many of the States are equipped to develop fertile fields for training within their boundaries. All that is needed is a central plan and the establishment of the necessary cooperative relationships. One State has two medical schools, and one of these has a very good psychiatric unit. Each school is relatively near a mental hospital. Both hospitals, in turn, are good ones and one of them is new. Also, a good child psychiatric center offering residential treatment is located in the same city with one of the medical schools. This particular State could undoubtedly arrange for cooperation between its training centers and its institutions in the very near future.

I cannot tell you that the job will be a short or easy one, for the whole training problem is long range. Now is the time, however, for action on realistic training programs designed to meet our needs. I would strongly urge the establishment of a working group of this association, to consider specific plans for the development of cooperation between training centers and your operating institutions and agencies. The National Institute of Mental Health stands ready to provide all possible aid.

I envision the goal of your training activities as being the development of a central recruitment and employment source within the State. Communications between States and training centers by way of regional State groupings, such as the Southern Regional Education Board and the Western Interstate Commission for Higher Education, could speed the realization of such sources. Anyone within the State could turn to the central source for personnel needs, and the State would be prepared to refer to sources for trained workers.

We are not the only ones who are wrestling with the need for more mental health personnel. State legislators throughout the Nation are also searching for solutions. I have talked with many of them, and I know that they are looking to us for leadership.

The American Psychiatric Association, as well, is deeply concerned with our needs. At the fall meeting of APA's council, I pointed out

the obligation of organized psychiatry and teachers to provide the necessary stimulation and experience for public mental health workers.

Our States and the psychiatric faculties are dynamic entities, ever on the move to accomplish their objectives. Foremost among their more immediate goals should be the development of cooperative relationships for more realistic and appropriate training. The goal of fertile training soil for our mental health personnel-to-be is surely worthy of our best efforts.

## Perspectives In Child Health

**By Martha M. Eliot, M.D., Sc.D.**  
**Former Chief of the**  
**Children's Bureau**

I am glad to be with you once more and to report to you on some activities of the Children's Bureau during the last year.

No one here has to be told what a long way we have yet to go before we attain that level of physical, mental, and social maturity that enables people to solve international problems without resort to armed conflict. Many of you would agree with me that we have made some progress, even though small, in recent years toward this goal. But may I say to you, who are the leaders in the field of health, that the contribution to that progress which you can make in the years ahead is tremendous.

If you ask me what you should do, my answer would be, look sharply and long at what each of you and your colleagues are doing to start a whole new generation of children on the road to healthy development, not just in body but in total personality. This calls for a generation of parents who understand more fully than most do now the meaning of their relationships with each other and with their children. It means a generation of parents who accept as fact what Dr. Brock Chisholm some years ago called "the most important business in the world, the one that outweighs all other values

in the world," the business of rearing children.

Basically, it means that all professional persons coming in contact with parents will themselves require an understanding of what is meant by healthy personality development in a child and how it is brought about. Often, an early contact, even before the birth of a baby, may be made by a child welfare worker, a teacher, a minister, a lawyer, a nutritionist, or by other health and welfare workers. But the role of child health workers—physicians, nurses, and many others—is of primary importance, for it is usually they who, year after year, will have the opportunity to make the earliest contact with young parents who are new to this business of child rearing.

### Support for Professional Workers

It is an important matter, then, that we should be constantly seeking ways to help professional workers understand the facts and the meaning of child growth and development and how each child is affected by the family environment into which he is born, by the biases and discriminations of the community in which he lives, by his physical and mental handicaps, and by many other factors.

If professional workers are to proceed in their activities with confidence that what they are doing and how they are doing it is based on up-to-date knowledge and experience, several moves are needed.

First, we must put the research information and clinical findings we have to better use. One of the most productive things we could do to promote healthy personality development and to prevent mental ill health would be to provide, to a variety of people, a continuous flow of information based on an evaluation and interpretation of research by workers well grounded in mental health concepts.

This kind of knowledge would be of value to professional workers, including those in operating programs, and the faculties of schools of medicine, public health, nursing, and social work. Such professional workers may often find it impossible to keep up with the great stream of knowledge flowing from research relating to children.

Parents, citizens groups, and others who

carry responsibility for children would have in a usable form the viewpoints, findings, and implications of studies of child rearing, child care, adult-child relationships, and of family and community provisions for children which appear to have a bearing on healthy personality growth and development.

Second, not only must we make more effective use of the research and clinical information we have, but we must broaden tremendously our knowledge about mental health, its cultural, personal, and environmental foundations, and its sources.

We need to know much more about the sources of emotional strength that help children withstand the inevitable destructive influences that make for mental and emotional disturbance. Greater understanding of these main-springs of mental health is a crucial part of the equipment of professional workers serving parents and children, and only research can supply it.

At the same time that we advance along the path toward the prevention and cure of mental illness, we need to test the knowledge we have and the knowledge we gain by evaluative research that will tell us to what extent the programs and services offered in these fields are effective.

More evaluative research must also be undertaken to give us a better picture of our successes and failures in maternity clinics, child health conferences, and school health services, in the use of the group process for helping parents, in the methods used by private physicians, in the care of children in hospitals, in institutions or foster family homes. With new and clarifying guidelines that could be derived from such studies, our work could be greatly improved.

Third, ways and means must be found to include in the teaching programs of schools of medicine, public health, nursing, social work, and law much more theoretical and practical instruction in child growth and development than is now included.

Recently, a prominent child psychiatrist stated that, for about 80 percent of emotional problems of childhood, care from psychiatrically trained personnel would not be needed. He believes that pediatricians and public health personnel could handle most of these problems

if they had adequate training in the development of children. In view of the continued overcrowding of child guidance clinics, it appears essential that nonpsychiatrically trained personnel learn to handle more effectively the more superficial problems.

What is needed to help bring this about is the introduction into schools of medicine, nursing, public health, social work, and other educational programs of an adequately supported teaching program covering the essentials of total child growth and development, and an understanding of interpersonal relations. Already some departments of pediatrics have begun to do this. Certain schools of public health nursing and schools of social work have also enriched their curriculums in this way. I regard such a training program as a vital undertaking and one that should have the support of all concerned with the business of child rearing.

I have dwelt somewhat at length on the need for this training program because of its long-range implication for the health of children and youth and because of its significance in any and every effort to advance toward a real base for peace.

At this point I would like to refer briefly to a few items of interest that have importance for the future.

## Radiological Health

A few months ago, a document of great significance to child development and to the population as a whole was published. I refer to the report of the National Academy of Sciences-National Research Council on "The Biological Effects of Atomic Radiation." The most striking aspect of this report is the relative importance for our population of cumulative exposure to X-ray and fluoroscopy. As you know, the human embryo, the fetus, infants, and children are especially sensitive to X-ray radiation. The results of radiation may range from genetic mutations in succeeding generations when the gonads are exposed, to embryonic damage when a pregnant woman receives excessive dosage on the pelvic organs, to damage to the blood-forming organs with resulting leukemia when radiation to the whole body is excessive.

The report is specific with respect to the maximum cumulative exposure to the gonads that is safe according to present knowledge. It recommends the adoption of a national standard of maximum exposure to radiation that is consistent with safety. The report also emphasizes the importance of reexamining current practices in the use of X-ray or fluoroscopy in providing medical services. Some of these appear to expose infants and children and prospective parents more than is necessary or wise.

Partly as a result of your interest and that of the Association of Maternal and Child Health and Crippled Children's Directors, and because of a recommendation of the United States National Committee on Vital and Health Statistics, the Children's Bureau is establishing a National Committee to Reduce Hazards to Inheritance and Child Development. Its members will represent a number of scientific disciplines and relevant programs in the maternal and child health field. This committee will give national leadership to planning for research and other activities designed to reduce reproductive wastage and safeguard normal fetal development.

A related committee on radiological hazards is being planned concurrently with the overall committee. It will develop proposals to promote good radiological techniques, particularly as applied to children and pregnant women. The work of both of these committees will be reported as they get under way.

## Child Health Programs

The Children's Bureau has welcomed the passage of the National Health Survey Act and looks forward to working closely with the Public Health Service in order to obtain the best information possible about the state of health of our child population. We know of your interest in the problem of congenital malformations and in children who have other types of crippling or handicapping conditions. We are looking forward to joint special studies to give us better information on the numbers and needs of these children than we have been able to obtain for many years.

The interest State health departments are showing in planning programs for mentally

retarded children portends a rapid and widespread development in this much neglected field. Congress, when it increased the maternal and child health grants from \$12 million to \$16 million, earmarked \$1 million for special projects for mentally retarded children and requested that an additional \$1 million be spent for this purpose. More than half the States are reported to be working on plans for programs for these children. Programs are already in operation in Arkansas, California, the District of Columbia, Hawaii, Idaho, and Washington; other requests are in the process of being approved. They are receiving fine support from parents and teachers as well as from the medical profession.

The rapidity with which the State crippled children's agencies expanded their programs last year when the grants were increased from \$11 million to \$15 million not only shows the need for services for children with chronic disease and handicapping conditions but testifies to your satisfactory administration of these programs. Otherwise such a rapid expansion would not have been possible.

A brief tabulation shows how these increased funds helped the crippled children's programs to grow last year. Thirty-nine States reported the increased funds were helping them to provide medical and hospital care for more children, and 19 States reported using the funds to help meet rising costs. The development of new and expanded programs, 20 of which were started in 16 States, includes the following:

	States
Cleft palate.....	9
Congenital heart disease.....	5
Rheumatic fever.....	8
Hearing impairment.....	15
Epilepsy.....	5
Arm amputations.....	2

The increasing child population and the mounting costs of these programs are in themselves basic problems. In 1955 the number of live births exceeded 4 million, a rate of 24.9 per 1,000 population and close to the highest in 30 years. The Nation's total child population under 18 years of age increased from 47 million in 1950 to 56 million in 1955, an 18 percent rise. The Bureau of the Census expects that between 1955 and 1965 the number of children under 18

years may rise by about 21 percent to a total of more than 67 million in 1965. This increase in child population will necessitate a continued expansion of the maternal and child health and crippled children's programs even if the only objective is the maintenance of the present rate of services.

The cost of providing health services continues to rise. The salaries of medical personnel in State health departments have increased 63 percent between 1947 and 1953. Salaries of public health nurses increased 74 percent. Hospital costs rose from an average of \$16.89 per patient-day in 1950 to \$22.78 in 1954, an increase of 35 percent. These are basic economic challenges which we must meet if our programs are to serve mothers and children even at present levels.

While infant mortality in the country as a whole has been reduced to a new record low of 27 per 1,000 infants born alive, infant losses in the perinatal period continue at a relatively high level. In 1954, for the United States as a whole, about 36 infants per 1,000 reported pregnancies were born dead or died in the neonatal period.

On the incidence and prevalence of maternal morbidity, we have few epidemiological facts to guide us. We do know, however, that more than 300,000 mothers a year in the United States are unable to carry their infants to term. This impairment in maternal health is associated with very high perinatal mortality in the infant.

We are following with much interest the reports on the effectiveness of the hormone Releasin in halting premature labor. If early results are confirmed, health departments will have a new agent to apply in the programs to reduce premature births and fetal and neonatal deaths.

### Shift in Pediatric Work

With the American College of Obstetrics and Gynecology and the American Academy of Pediatrics, the Children's Bureau is sponsoring a project to develop more effective analysis of maternity and newborn infant hospital records with a view toward improving the care of mother and child in hospitals. This project is

planned as a 3-year study to be conducted in all hospitals in a cooperating community. The project will develop and demonstrate ways and means by which hospital staff can obtain maternity and newborn infant statistics useful not only to the individual hospital but also to the community as a whole in maintaining a high level of maternity and neonatal care. When the method is tested, we look forward to its use by many different kinds of hospitals, large and small, teaching and nonteaching, where the births in the United States take place.

Much progress has been made by the States in the past 20 years in the development of the crippled children's program with a major emphasis on orthopedics. Now, with the availability of specific therapeutic agents for many acute diseases, we are seeing a shift in emphasis in pediatric work. Throughout the country there is an increased interest among pediatricians in the care of children with chronic disease and handicapping conditions.

The long-range problem that I see ahead of us in the crippled children's program is to find the way to develop in each State adequate resources for the care of children who are handicapped and require long-term medical supervision and rehabilitative services. The number of children with handicaps other than orthopedic in nature are estimated to be nearly 10 times the number of orthopedically handicapped children. Yet they represent less than one-half of the children now receiving care under the crippled children's program. In developing clinics and other services for children with epilepsy, cleft palate, congenital heart disease, hearing impairment, limb amputations, and so forth, you have unusual opportunities for putting to work the knowledge that research is providing. Research makes it possible to treat or ameliorate much of childhood crippling, to rehabilitate children, and to prevent the progression of disability.

There are of course many more phases of your programs for children on which I could comment. I would like to make just one more point which has to do with the role State health departments play when the responsibility for health services or medical care for special groups of people rests in other State depart-

ments or agencies under either Federal or State laws or regulations.

As I see it, your minimum role is to make sure that preventive health services are included in all such programs and that the highest possible standards of care for the sick or disabled are set and adhered to. I am thinking of the new program of medical care for the dependents of men in the armed forces, especially the children among these dependents. I am thinking

of what you can do to work with the State departments of public welfare in raising standards of medical care provided for the aged and for dependent children under the new amendments to the Social Security Act that will become effective next July.

The benefits for our children to be derived from all of the programs I have mentioned represent a real investment in the future of our country, indeed, in the future of the world.

### Dr. Eliot Leaves Children's Bureau



Dr. Martha M. Eliot has resigned as chief of the Children's Bureau, the office she held the last 5 of her 30 years of Government service. She returns to her native Massachusetts to head the maternal and child

health department of the Harvard School of Public Health.

In accepting Dr. Eliot's resignation, President Eisenhower noted her invaluable contributions to the "cause of better health and welfare of children, not only in our own Nation but around the world." In his letter he said, "I share with Secretary Folsom the hope that your new activities will be richly rewarding and that we may count upon your advice and help in the years to come."

Dr. Eliot was the first and only woman to be elected president of the American Public Health Association. For administrative achievement in organizing and operating a Government program that served a million and a half GI wives and infants in the Second

World War, Dr. Eliot was given the Lasker Award.

From 1949 to 1951, Dr. Eliot was Assistant Director-General of the World Health Organization. She was chairman of its Expert Committee on Maternal and Child Health in 1949, having served in 1948 as a member of the United States delegation to the First World Health Assembly in Geneva.

A graduate of Radcliffe with her doctorate from Johns Hopkins, Dr. Eliot began her long and distinguished career in maternal and child health services at the Peter Bent Brigham Hospital, Boston. She joined the Yale University Medical School in 1921 as instructor in the pediatric department from which she came to Washington as director of the Division of Maternal and Child Health in the Children's Bureau. There she directed one of the Bureau's first research programs, the prevention and control of rickets in children.

She served on the Board of Editors of *Public Health Reports* from its reorganization as a monthly periodical in 1952 until 1956.

*The large deficit in mortality from diseases of the cardiovascular-renal system and from diabetes mellitus among Navajo Indians is too great to be accounted for by certain types of errors in death certification. Further epidemiological studies are required to explain why this tribe enjoys a more favorable experience with these diseases than white and other nonwhite Americans.*

## Cardiovascular-Renal and Diabetes Deaths Among the Navajos

By ROBERT LINCOLN SMITH, M.D., M.P.H.

IN A PREVIOUS paper Salsbury, Gilliam, and I showed that deaths certified as caused by cancer and by diseases of the circulatory and central nervous systems were substantially fewer among the Navajo Indians than would have been expected had observed white or non-white death rates prevailed (1). However, we pointed out that the apparent deficit of cancer alone could not be regarded as established beyond all reasonable doubt because of the large number of deaths in older Navajos for whom the cause of death was uncertain. Either the deceased had not been attended by the physician signing the death certificate or the cause of death had been assigned to senility. Nevertheless, the study clearly showed that the deficit in cancer and in cardiovascular-renal diseases,

taken all together, was too great to be accounted for by faulty death certification alone.

Other authors have also called attention to apparent deficits in these diseases among the Navajo Indians. Dealing with death certificate data, Hadley has noted that diseases of the heart, cancer, and vascular lesions affecting the central nervous system were not among the 6 leading causes of death for Navajos in 1950 (2).

Salsbury has observed that a diagnosis of some form of heart disease was made on only 0.4 percent of 4,826 admissions (mostly of Navajos) to the Sage Memorial Hospital at Ganado, Ariz., during the years 1931-35 (3).

Gilbert has reported that no clinically proved case of coronary thrombosis was found among 10,276 Navajos admitted to the Navajo Medical Center for the years from 1949 to 1952 (4).

In addition, Joslin (5, 6), Salsbury (7), and Cohen (8) have remarked on the infrequent recognition of diabetes among Navajo Indians.

Because of these observations, I have extended the analyses of the previous study on the Navajos (1) and have compared expected mortality with recorded mortality for the various specific causes that make up the broad cardiovascular-renal group of diseases. Since the data comprising this study approximate all of

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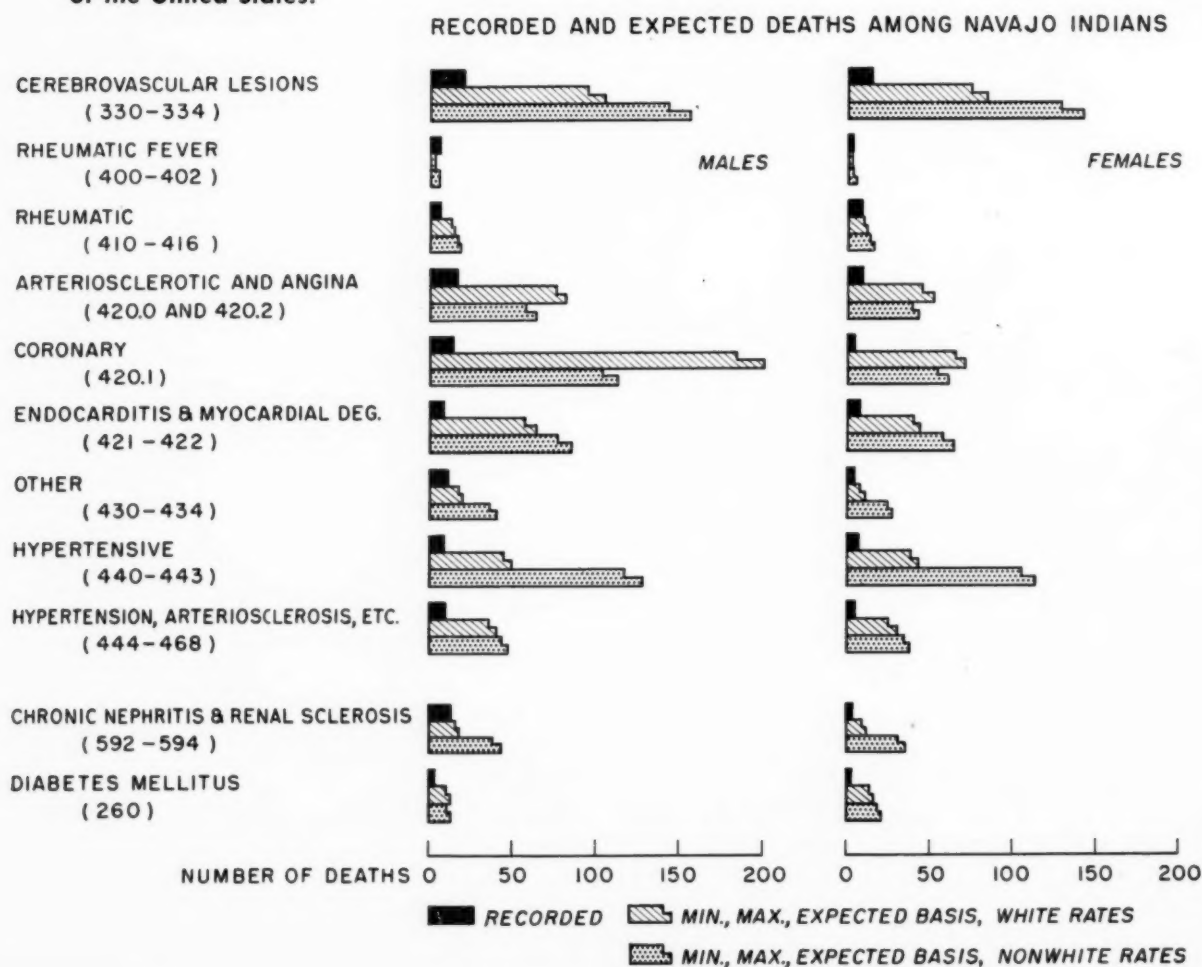
the deaths occurring in a whole and fairly well defined population group, the results provide a better idea of forces of mortality among the Navajos than could be obtained from analyses of admissions to, or deaths in, any one hospital serving the tribe.

### Method of Study and Results

The first article described how the Navajo deaths recorded by the Navajo Indian Agency were tabulated for the 5-year period 1948-52 (1). Because we were uncertain about the exact population base from which death certificate data were available, we estimated the Navajo population on the basis of the published 1950 census enumeration (64,374) of Indians resid-

ing in the area served by the Navajo Agency and on the basis of the total number (70,567) of Navajos estimated by the Navajo Agency for the same year, distributing the population by sex and age as in the census enumeration. These population estimates yielded a minimum and a maximum number of expected deaths, computed by multiplying the 1950 age-specific, sex-specific, and cause-specific death rates for the entire white United States population by the corresponding estimate in each of the two Navajo population groups. The results summed for all age groups and multiplied by 5 comprise the number of deaths from each cause that might be expected to occur among the Navajo Tribe in the 5 years centering around 1950 if all Navajos had been subjected

**Figure 1. Recorded deaths among Navajo Indians, 1948-52, which were attributed to cardiovascular-renal diseases and diabetes mellitus, and deaths expected on the basis of 1950 age-specific, sex-specific, and cause-specific death rates for the white and nonwhite populations of the United States.**



**Table 1. Deaths among the Navajos attributed to cardiovascular-renal diseases and to diabetes mellitus during the 5-year period 1948-52 and deaths expected on the basis of age- and sex-specific rates observed in 1950 among the white and nonwhite United States populations**

Cause of death <sup>1</sup>	Men					Women				
	Num- ber of re- corded deaths	Expected <sup>2</sup> deaths on basis of—				Num- ber of re- corded deaths	Expected <sup>2</sup> deaths on basis of—			
		White rates		Nonwhite rates			White rates		Nonwhite rates	
		Mini- mum	Max- imum	Mini- mum	Max- imum		Mini- mum	Max- imum	Mini- mum	Max- imum
Major cardiovascular-renal diseases (330-334, 400-468, 592-594)-----	105	534.5	587.0	629.7	691.5	73	324.1	356.0	494.2	542.6
Vascular lesions affecting central nervous system (330-334)-----	<sup>3,4</sup> 19	93.9	103.1	141.6	155.5	<sup>5</sup> 15	75.2	82.6	129.2	141.9
Diseases of the circulatory system (400-468)-----	73	425.0	466.7	448.6	492.6	54	238.0	261.4	332.7	365.3
Rheumatic fever (400-402)-----	5	1.8	2.0	3.8	4.2	<sup>6</sup> 3	2.0	2.2	4.3	4.7
Diseases of the heart (410-443)---	59	388.2	426.2	402.8	442.3	46	211.0	231.7	294.4	323.3
Chronic rheumatic heart disease (410-416)-----	5	13.1	14.4	16.2	17.7	<sup>6</sup> 10	11.2	12.2	14.3	15.7
Arteriosclerotic heart disease including coronary disease (420)-----	29	257.6	282.9	159.2	174.9	15	111.1	122.0	94.9	104.2
Arteriosclerotic heart disease, so described (420.0)-----	<sup>7</sup> 14	72.8	79.9	55.4	60.8	<sup>3</sup> 10	45.4	49.9	37.7	41.4
Heart disease specified as involving coronary arteries (420.1)-----	<sup>8</sup> 13	183.0	200.9	101.8	111.8	<sup>6</sup> 5	65.0	71.3	55.9	61.4
Angina pectoris (420.2)-----	<sup>5</sup> 2	1.8	2.0	2.0	2.3	0	.7	.8	1.2	1.3
Nonrheumatic chronic endo- carditis and other myo- cardial degeneration (421- 422)-----	7	57.1	62.7	76.2	83.7	8	40.7	44.7	57.1	62.7
Chronic endocarditis not spec- ified as rheumatic (421)---	1	6.4	7.1	14.4	15.8	1	4.2	4.6	10.0	11.0
Other myocardial degenera- tion (422)-----	<sup>6</sup> 6	50.7	55.6	61.8	67.9	7	36.5	40.1	47.1	51.7
Other diseases of the heart (430-434)-----	<sup>3,4</sup> 10	16.8	18.5	35.7	39.2	<sup>6</sup> 6	8.7	9.6	24.7	27.1
Hypertension with heart dis- ease (440-443)-----	8	43.6	47.7	115.5	126.8	7	39.3	43.2	103.4	113.6
Hypertensive heart disease with arteriolar nephroscle- rosis (442)-----	4	15.0	16.4	37.2	40.8	<sup>4,6</sup> 6	11.1	12.2	28.3	31.1
Essential hypertension with heart disease, etc. (440, 441, 443)-----	<sup>6</sup> 4	28.6	31.3	78.3	86.0	1	28.2	31.0	75.1	82.5
Hypertension without mention of heart (444-447)-----	3	7.4	8.1	17.0	18.7	0	5.6	6.1	14.9	16.5
Hypertension with arteriolar nephrosclerosis (446)-----	3	4.0	4.4	7.8	8.6	0	2.5	2.7	5.5	6.1
Essential hypertension and other hypertensive disease (444, 445, 447)-----	0	3.4	3.7	9.2	10.1	0	3.1	3.4	9.4	10.4
General arteriosclerosis (450)---	3	22.4	24.6	19.8	21.7	3	16.2	17.8	13.8	15.1
Other diseases of circulatory sys- tem (451-468)-----	3	5.2	5.8	5.2	5.7	2	3.2	3.6	5.3	5.7
Chronic and unspecified nephritis and other renal sclerosis (592-594)	<sup>4</sup> 13	15.6	17.2	39.5	43.4	4	10.9	12.0	32.3	35.4
Diabetes mellitus (260)-----	3	11.7	13.0	11.6	12.8	3	14.2	15.6	18.9	20.7

<sup>1</sup> Numbers in parentheses represent diseases listed in the International Statistical Classification of Diseases, Injuries, and Causes of Death, 6th revision.

<sup>2</sup> The minimum and maximum numbers of deaths expected are dependent on different estimates of the number and age composition of the Navajo population at risk.

<sup>3</sup> In 2 cases death certificate signed by physician not in attendance.

<sup>4</sup> In 1 case death certificate not signed by a physician.

<sup>5</sup> In 2 cases death certificate not signed by a physician.

<sup>6</sup> In 1 case death certificate signed by physician not in attendance.

<sup>7</sup> In 4 cases death certificate signed by physician not in attendance.

<sup>8</sup> In 3 cases death certificate signed by physician not in attendance.

to the same age-specific and sex-specific rates prevailing in the population of the United States as a whole.

The results of these computations are shown in figure 1 and table 1. Numbers in parentheses refer to diseases listed in the International Statistical Classification of Diseases, Injuries, and Causes of Death, sixth revision.

Only 105 male deaths during the 5-year period were charged to the major cardiovascular-renal diseases although from 534 to 692 deaths would have been expected on the basis of rates prevailing among the white and nonwhite United States populations (table 1). Deaths recorded from these causes were, therefore, only 15 to 20 percent of the deaths expected. Similar results are noted among women. Seventy-three deaths were recorded as compared with an expectation of 324 and 543 deaths. The standardized mortality ratios thus computed for women vary between 13 and 23.

Further examination of table 1 shows that this very large total deficit is contributed to by all of the individual causes of death except rheumatic fever. Rheumatic fever, however, accounted for only a small number and proportion of deaths. Five deaths were recorded for men and three for women. Note also that the differences between recorded and expected deaths are not great for chronic rheumatic heart disease, especially among Navajo women. When comparisons are made on the basis of rates prevailing among the white population, little difference is noted between expected and observed deaths for chronic and unspecified nephritis and other renal sclerosis (592-594), for hypertension with arteriolar nephrosclerosis without mention of heart (446), and for the category that includes acute and subacute endocarditis, acute myocarditis, acute pericarditis, and functional and other unspecified heart diseases (430-434). For these same diseases, however, substantial differences are noted in comparison with nonwhite experience.

Among the causes of death tabulated, the greatest deficit is observed for coronary disease (420.1), for which the mortality recorded is only 6 to 13 percent of that expected in men and only 7 to 9 percent of that expected in women. This deficit is equally as outstanding in the age

group 45 to 64 as it is in the group 65 years of age and older.

Diabetes mellitus (260) was the assigned cause of death for 3 men and 3 women, but the number of expected deaths varied from 12 to 13 for men and from 14 to 21 for women.

## Discussion and Conclusion

In the foregoing I have shown that deaths attributed to cardiovascular-renal diseases among the Navajo Tribe are substantially less than would be expected had United States white or nonwhite death rates prevailed. With the exception of rheumatic fever, all of the major causes of death that were considered have contributed to this deficit. In evaluating the deficit, however, consideration must be taken of three facts to which the first study called attention (1).

The first is that deaths other than violent deaths among Navajos in the ages of highest cancer risk (45 years of age and older) which were unattended by a physician or which were assigned to senility and to other ill-defined

**Table 2. Deaths attributed to cardiovascular-renal diseases,<sup>1</sup> difference between recorded and expected deaths**

Age (years)	Re- corded deaths	Expected deaths		Difference		
		Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	
		Men				
Under 45-----	37	31. 8	75. 4	+ 5	— 38	
45-64-----	18	140. 7	246. 4	— 123	— 228	
65 and over-----	50	362. 0	369. 7	— 312	— 320	
Total----	105	534. 5	691. 5	— 430	— 586	
		Women				
Under 45-----	29	20. 1	83. 6	+ 9	— 55	
45-64-----	15	51. 9	178. 7	— 37	— 164	
65 and over-----	29	252. 1	280. 3	— 223	— 251	
Total----	73	324. 1	542. 6	— 251	— 470	

<sup>1</sup> Numbered 330-334, 400-468, 592-594 in the International Statistical Classification of Diseases, Injuries, and Causes of Death, 6th revision.

**Table 3. Deaths (except violent deaths) which were either unattended by the physician signing death certificate or attributed to senility or other ill-defined cause**

Age	Men	Women
Under 45	244	269
45-64	50	35
65 and over	76	54
Total	370	358

causes were more than enough to account numerically for the recorded deficit of cancer. When this point is examined for cardiovascular-renal diseases, however, the deficit is too large to be accounted for in this way. Because of the greater uncertainty of correct diagnosis in the very old, we compared the deficit of mortality in the cardiovascular-renal diseases with the number of unreliably certified deaths among Navajos in the age groups 45 to 64 and 65 and older. The deficit in recorded mortality attributed to cardiovascular-renal diseases is shown in table 2, and the deaths assigned to senility or ill-defined causes and unattended deaths are shown in table 3.

Comparison of tables 2 and 3 clearly shows a much larger deficit of recorded cardiovascular-renal diseases in Navajos 65 years of age and older than could be accounted for even if all of the unreliably certified deaths were due to these causes. This is also true for Navajos 45 to 64 years of age, though to a lesser extent. For deaths occurring among members of the tribe under 45 years of age, the calculated deficit of cardiovascular-renal diseases for both men and women is much less than the unreliably certified deaths. There are, in fact, a few more deaths recorded from these causes than would be expected on the basis of the minimum estimate. However, it is reasonable to assume that most of the unreliably certified deaths in Navajos under 45 are properly assignable to causes other than cardiovascular-renal, especially since 200 of the 244 deaths in males and 209 of the 269 deaths in females occurred in individuals under 25 years of age.

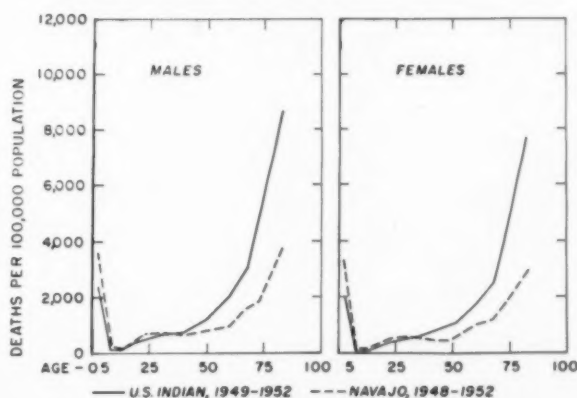
Second, there was a question whether some of the excess Navajo mortality certified as caused by respiratory and digestive diseases might ac-

tually be due to cancer or cardiovascular-renal diseases. That this is unlikely is indicated by the fact that the excess mortality in these diseases is almost entirely limited to Navajo children less than 5 years old. This is also true, though to a lesser degree, for the excess mortality attributed to respiratory tuberculosis. Excess mortality for respiratory tuberculosis occurred principally in Navajos under 45 years of age. For those 45 years and over mortality from respiratory tuberculosis was only moderate.

A third consideration is the fact that age-specific death rates for all causes in older ages are lower among the Navajo Indians than among all Indians. The difference between these rates becomes progressively greater with age as is seen in figure 2. While this fact is suggestive of under-reporting of Navajo deaths in the older age groups, it is also consistent with the idea that the Navajo Tribe is subject to different forces of mortality from those operating for Indians as a whole. In any event, under-reporting must be considered as a potential factor contributing to the observed deficit in mortality attributed to cardiovascular-renal disease.

To test the possible effect of under-reporting, deaths for all causes recorded among the Navajos were compared with deaths expected had the tribe experienced the overall mortality of all American Indians. Though the results of these calculations are not illustrated, they did show fewer deaths from all causes among

**Figure 2. Average annual age-specific and sex-specific death rates for all causes among all American Indians, 1949-52, and among the Navajo Indians, 1948-52.**



older Navajo Indians, such as might have been anticipated from the rates shown in figure 2. It seems highly unlikely that all postulated under-recording of deaths could be attributed to cardiovascular-renal diseases alone. Even if it were, however, under-recording at its maximum was hardly sufficient to account for the deficit of cardiovascular-renal mortality shown in table 2. The evidence therefore favors the view that the Navajo Tribe experienced a real deficit of cardiovascular-renal disease. The true magnitude of this deficit cannot be assessed accurately from these data.

Analysis of mortality recorded among Navajo Indians supports the view that cardiovascular-renal diseases are less commonly encountered among this tribe of American Indians than in the general white and nonwhite populations of the United States.

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# Geographic Variation in Leukemia Mortality in the United States

By BRIAN MacMAHON, M.D.

DIFFERENCES BETWEEN countries in the recorded death rate from leukemia are considerable. Notable differences are evident even when countries with reasonably complete death registration are compared. For example, the United States, Denmark, and Sweden experience death rates from leukemia  $1\frac{1}{2}$  times as high as those of Canada, Great Britain, and France, which again have much higher rates than Ireland, Italy, or Finland (1).

Geographic variation within countries has also been noted. Hewitt (2), examining death registration data for England and Wales, noted a fairly regular gradient from a relatively low level in the north to a level about half as high again in the south. Material from the Danish Cancer Registry (3) showed highest rates in the capital and lowest in the rural areas. Otherwise, there were no definite topographical differences in Denmark. Higher rates for the urban compared with the rural population have been noted also in the United States (4). Death registration data for leukemia in the United States have been examined on a number of occasions (5-8), but no study of geographic variation between regions or States within the United States has been reported.

The National Office of Vital Statistics of the

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Public Health Service has published annually data on deaths from leukemia in the United States, classified according to State of residence, sex, race, and age, since 1949 (9). Prior to 1949 the reports did not include a breakdown by age for deaths from this cause in the individual States. The present study is based in the main, therefore, on data for the 5 years 1949-53. Attention is confined to the white population. Age-standardized death rates are shown in table 1 for the male, female, and total populations of each State and each division. The standard population used was the total white population of the United States in 1950; nine age groups were used in the standardizations.

In addition to the standardized rates, comparative mortality indexes for the individual States are given in table 1. These indexes express the observed number of deaths in each area as a percentage of the number of deaths expected in the area on the basis of (a) the age and sex distribution of the population of the area, and (b) the age-specific and sex-specific death rates from leukemia observed in the total United States white population.

## Differences Between Divisions

The nine divisions into which the States are grouped are those used by the Bureau of the Census. Differences between them in leukemia death rate were not great. The highest division, Pacific, with a mean annual death rate of 69.9 per million, was 20 percent higher than the lowest, East South Central, with a rate of 58.4.

**Table 1. Leukemia death rates and characteristics for the white population of States and divisions of the United States, 1949-53 and 1938-42**

Division and State	Number of leukemia deaths 1949-53			Standardized death rate per million, 1949-53			Corrected sex ratio 1949-53 (percent male)	Comparative mortality index 1949-53	Comparative mortality index 1938-42	Percentage increase from 1938-42 to 1949-53	Mean yearly increment in leukemia death rate <sup>1</sup>		Physicians per 100,000 population, 1949
	Male	Female	Total	Male	Female	Total					1938-45	1946-53	
<b>New England</b>	<b>1,687</b>	<b>1,331</b>	<b>3,018</b>	<b>71.8</b>	<b>52.7</b>	<b>62.2</b>	<b>57.7</b>	<b>97</b>	<b>67</b>	<b>45</b>	<b>1.8</b>	<b>2.0</b>	<b>151</b>
Maine	136	108	244	56.5	43.5	50.0	56.5	78	55	42	1.5	— .2	97
New Hampshire	97	84	181	67.2	54.2	60.7	55.4	95	47	102	2.6	1.8	126
Vermont	80	69	149	80.3	67.4	73.8	54.4	114	57	100	—	—	140
Massachusetts	881	683	1,564	75.0	52.6	63.7	58.8	99	73	36	1.5	2.6	170
Rhode Island	111	87	198	58.9	42.5	50.7	58.1	78	59	32	.8	1.6	118
Connecticut	382	300	682	77.6	58.2	67.9	57.1	105	69	52	2.8	1.5	152
<b>Middle Atlantic</b>	<b>5,400</b>	<b>4,171</b>	<b>9,571</b>	<b>75.9</b>	<b>56.5</b>	<b>66.2</b>	<b>57.3</b>	<b>103</b>	<b>75</b>	<b>37</b>	<b>1.4</b>	<b>2.5</b>	<b>161</b>
New York	2,908	2,177	5,085	82.4	59.0	70.6	58.3	110	83	33	1.7	2.4	196
New Jersey	862	645	1,507	77.0	55.3	66.1	58.2	103	72	43	1.6	2.6	128
Pennsylvania	1,630	1,349	2,979	66.2	53.5	59.8	55.3	93	65	43	2.0	2.5	128
<b>East North Central</b>	<b>5,516</b>	<b>3,875</b>	<b>9,391</b>	<b>75.1</b>	<b>53.2</b>	<b>64.1</b>	<b>58.5</b>	<b>100</b>	<b>68</b>	<b>47</b>	<b>2.0</b>	<b>2.5</b>	<b>118</b>
Ohio	1,473	1,077	2,550	76.7	55.4	66.0	58.1	103	63	63	1.6	3.8	116
Indiana	691	478	1,169	71.1	49.2	60.1	59.1	93	58	60	2.0	1.2	103
Illinois	1,551	1,122	2,673	74.1	53.4	63.5	58.1	99	76	30	1.5	1.7	141
Michigan	1,096	708	1,804	75.0	50.3	62.6	59.9	97	66	47	1.4	2.7	106
Wisconsin	705	490	1,195	78.2	56.7	67.4	58.0	105	75	40	2.5	3.2	104
<b>West North Central</b>	<b>2,948</b>	<b>2,056</b>	<b>5,004</b>	<b>79.7</b>	<b>58.1</b>	<b>68.8</b>	<b>57.8</b>	<b>107</b>	<b>71</b>	<b>51</b>	<b>2.0</b>	<b>3.5</b>	<b>113</b>
Minnesota	749	481	1,230	94.3	64.2	79.2	59.5	124	90	38	— .5	3.7	132
Iowa	572	393	965	78.6	55.6	67.1	58.6	105	67	57	4.0	3.7	105
Missouri	711	510	1,221	71.4	50.3	60.8	58.7	95	61	56	1.9	2.7	120
North Dakota	101	85	186	63.7	63.1	63.4	50.2	97	74	31	2.7	1.9	75
South Dakota	141	82	223	83.5	55.7	69.5	60.0	108	69	57	1.6	2.4	73
Nebraska	287	193	480	79.6	55.7	67.6	58.8	106	70	51	4.0	3.9	113
Kansas	387	312	699	77.5	63.7	70.6	54.9	110	67	64	1.1	4.9	103
<b>South Atlantic</b>	<b>2,444</b>	<b>1,804</b>	<b>4,248</b>	<b>67.6</b>	<b>50.3</b>	<b>58.9</b>	<b>57.3</b>	<b>91</b>	<b>56</b>	<b>63</b>	<b>1.9</b>	<b>2.1</b>	<b>96</b>
Delaware	56	35	91	83.2	49.7	66.4	62.6	103	66	56	—	—	126
Maryland	290	238	528	64.9	49.7	57.2	56.6	89	62	44	1.7	2.1	136
District of Columbia	99	73	172	84.0	52.2	67.9	61.7	104	95	9	— .3	— 1.3	267
Virginia	356	283	639	62.0	48.6	55.2	56.1	87	55	58	2.6	1.5	91
West Virginia	307	195	502	69.3	46.1	57.6	60.1	90	49	84	1.9	2.5	84
North Carolina	382	317	699	61.0	49.8	55.4	55.1	89	54	65	1.9	1.8	79
South Carolina	175	136	311	70.1	49.6	59.8	58.6	89	45	98	2.1	1.5	69
Georgia	373	268	641	72.2	50.4	61.2	58.9	95	58	64	1.5	2.2	84
Florida	406	259	665	71.7	46.1	58.8	60.9	92	51	80	1.8	3.9	91
<b>East South Central</b>	<b>1,372</b>	<b>1,003</b>	<b>2,375</b>	<b>67.9</b>	<b>49.1</b>	<b>58.4</b>	<b>58.0</b>	<b>93</b>	<b>48</b>	<b>94</b>	<b>1.7</b>	<b>2.7</b>	<b>79</b>
Kentucky	418	307	725	63.1	47.4	55.2	57.1	86	43	100	2.1	3.0	84
Tennessee	425	343	768	68.4	53.0	60.6	56.3	102	52	96	1.6	3.0	90
Alabama	332	227	559	72.0	47.7	59.7	60.2	92	43	114	1.9	2.8	68
Mississippi	197	126	323	71.6	45.9	58.7	60.9	91	56	63	.8	1.3	64
<b>West South Central</b>	<b>2,053</b>	<b>1,434</b>	<b>3,487</b>	<b>73.5</b>	<b>51.1</b>	<b>62.2</b>	<b>59.0</b>	<b>97</b>	<b>53</b>	<b>83</b>	<b>1.7</b>	<b>3.3</b>	<b>95</b>
Arkansas	240	161	401	65.7	46.4	56.0	58.6	87	40	118	2.8	3.7	82
Louisiana	316	209	525	81.2	50.6	65.8	61.6	102	55	85	1.6	3.3	104
Oklahoma	376	267	643	73.6	53.3	63.4	58.0	98	44	123	2.4	4.8	94
Texas	1,121	797	1,918	74.3	52.2	63.2	58.7	98	59	66	1.0	2.8	95
<b>Mountain</b>	<b>850</b>	<b>609</b>	<b>1,459</b>	<b>72.4</b>	<b>55.8</b>	<b>64.1</b>	<b>55.9</b>	<b>100</b>	<b>56</b>	<b>79</b>	<b>.9</b>	<b>3.9</b>	<b>110</b>
Montana	130	85	215	81.8	64.6	73.2	55.9	113	67	69	1.6	5.5	94
Idaho	127	77	204	85.7	59.5	72.5	59.0	114	50	128	.8	8.1	77
Wyoming	36	27	63	51.8	48.7	50.3	51.5	75	53	42	—	—	83
Colorado	229	187	416	69.3	57.6	63.4	54.6	99	59	68	.3	3.4	158
New Mexico	79	60	139	56.7	49.1	52.9	53.6	85	46	85	1.6	.0	73
Arizona	102	78	180	69.0	53.1	61.0	56.5	96	51	88	— .2	4.7	97
Utah	117	77	194	80.1	50.7	65.3	61.2	102	55	85	2.4	4.5	115
Nevada	30	18	48	75.0	57.2	66.1	56.7	103	52	98	—	—	110
<b>Pacific</b>	<b>2,802</b>	<b>2,077</b>	<b>4,879</b>	<b>80.5</b>	<b>59.3</b>	<b>69.9</b>	<b>57.6</b>	<b>107</b>	<b>75</b>	<b>43</b>	<b>2.6</b>	<b>2.3</b>	<b>132</b>
Washington	477	312	789	77.3	54.7	65.9	58.6	97	70	39	3.4	2.0	106
Oregon	337	195	532	84.4	52.7	68.5	61.6	107	71	51	3.6	4.3	109
California	1,988	1,570	3,558	81.0	61.3	71.0	56.9	110	77	43	1.6	2.0	142

<sup>1</sup> Values are not calculated for States with less than 500,000 white population in 1950.

All three southern divisions (East South Central, West South Central, and South Atlantic) had rates lower than any other area. By contrast, rates were highest in the west. The Pacific, Mountain, and West North Central divisions ranked first, second, and fourth in order of leukemia death rates.

Since Meadors (4) found the leukemia death rate approximately  $1\frac{1}{2}$  times higher in the urban than in the rural population of the United States, some relationship between leukemia death rate and degree of urbanization of the area might be expected. The lower leukemia death rate in the three southern divisions is consistent with this expectation. However, among the other six divisions, the death rates showed little relationship to the pattern of urbanization. The two divisions with the highest leukemia rates, Pacific and West North Central, were third and seventh in a listing according to urbanization. The two most urban divisions, Middle Atlantic and New England, ranked third and sixth according to leukemia death rates. Meadors' finding was based on a direct comparison of the urban and rural populations and is therefore in no way invalidated by the finding of high leukemia rates in areas with low urbanization, or vice versa. It seems likely, however, that the urban-rural difference in leukemia death rates was operating during the period of the present study to reduce some of the geographic differences between divisions.

Adjustment of the divisional death rates is possible on the basis of the known percentage of the population of the division classified as urban, and the assumption that the rates for the urban population were  $1\frac{1}{2}$  times higher than those for the rural population in each division. This assumption was made on the basis of Meadors' findings for the whole United States. After adjustment on this basis, divisional death rates were West North Central 72.7, Pacific 66.8, Mountain 66.3, East South Central 64.9, West South Central 64.3, East North Central 63.1, South Atlantic 62.6, Middle Atlantic 61.9, and New England 59.1. The adjustment has raised the rates for the southern divisions relative to divisions in the northeast, suggesting that the originally low rates in the south may result from

the lower percentage of urban population there. However, the adjustment has accentuated the difference between the west and the northeast. The three western divisions now rank first, second, and third in order of leukemia death rates.

#### Differences Between States

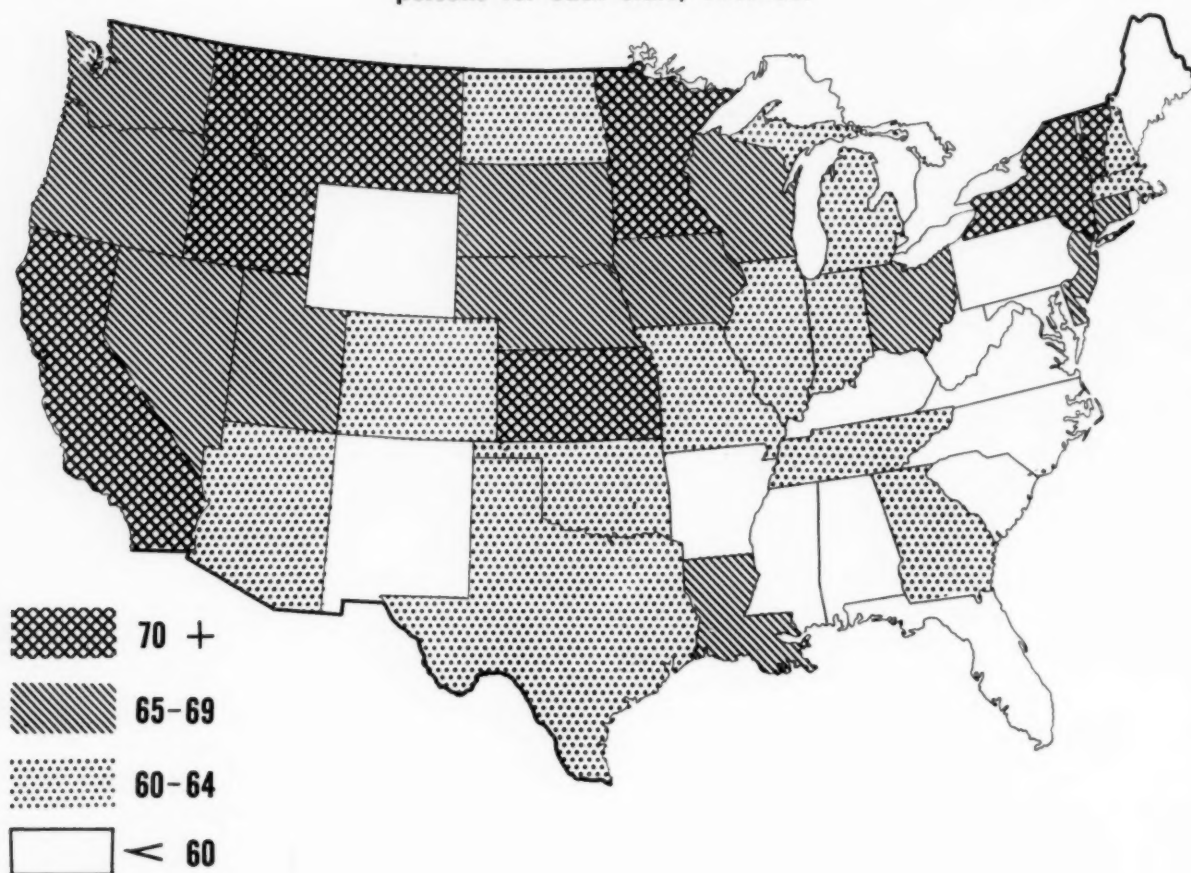
The individual States showed greater variation in leukemia death rates than the divisions (table 1, fig. 1). States with the highest rates in 1949-53 were Minnesota (79.2), Vermont (73.8), Montana (73.2), Idaho (72.5), California (71.0), New York (70.6), and Kansas (70.6). Lowest rates were in Maine (50.0), Wyoming (50.3), Rhode Island (50.7), and New Mexico (52.9).

Greatest variation in leukemia death rates was between States constituting the New England and Mountain divisions. New England included the second highest State (Vermont) as well as the 46th and 48th (Rhode Island and Maine). In the Mountain division there was disparity between the four northwestern States with the rates of 73.2, 72.5, 65.3, and 66.1, and the four southeastern States with rates of 63.4, 61.0, 52.9, and 50.3. The three Middle Atlantic States showed less variation, from 70.6 in New York to 59.8 in Pennsylvania.

On the other hand, the States constituting the three southern divisions showed fair uniformity in their low individual rates. Of the 17 States (including the District of Columbia) in these divisions, only the District of Columbia, Delaware, and Louisiana, with rates of 67.9, 66.4, and 65.4, respectively, had rates higher than the overall rate for the country (64.4). Similarly, the States of the Pacific and the West North Central divisions showed almost uniformly high rates. Of the 10 States in these divisions, only North Dakota and Missouri, had rates lower than the national average.

Once again it might be expected that some of these geographic variations could be attributed to differences between States in variables which are known to affect leukemia death rates, such as urban dwelling (3, 4) and income (5, 10, 11). Coefficients have been calculated for the correlation of the comparative mortality index in each State with the percentage of the white pop-

Figure 1. Mean annual age- and sex-standardized leukemia deaths per 100,000 white persons for each State, 1949-53.



ulation of the State classified as urban in 1950, the median income of the white population in 1949, and the number of active non-Federal physicians per 100,000 population in 1949. The correlation with the percentage of urban population was small and insignificant ( $r=0.13 \pm 0.14$ ), but higher correlations were found with both median income ( $r=0.27 \pm 0.14$ ) and density of physicians ( $r=0.35 \pm 0.14$ ). Partial correlation suggested closer association of the leukemia death rate with density of physicians when income was kept constant ( $r=0.24$ ) than with income with physician density constant ( $r=0.06$ ).

The interpretation of these associations is discussed below. It is clear however that they account for only a part of the geographic variation. In sharp contrast to this trend are, for example, the high leukemia rates noted in certain Mountain and other western States in spite of low physician:population ratios, and the

relatively low leukemia rates found in the industrial middle west.

#### Variations by Age and Sex

The general pattern of the distribution of death rates among States was similar for males and females. The coefficient of correlation between the rates for males and females in the same States was  $0.55 \pm 0.14$ . There is a suggestion that the sex ratio tended to be high in those States with high total death rates ( $r=0.26 \pm 0.14$ ). However, the correlation coefficient is not significant. In general, sex ratios were constant at about 58 percent male from division to division, and, even between States, differences were small (table 1). In the few States in which the proportion of males affected was higher than average, the age trend was not such as to suggest any specific occupational risk.

Numbers are too small for reliable examina-

tion of age trends in the individual States, but divisional age-specific rates are examined in table 2. The rate for each age group for each division is shown as a percentage of the rate for the United States in the same age group. The rates in the Pacific division were particularly high (compared with total United States rates) in the age groups 0-14 and to a lesser extent in the older age groups. In the West North Central division, on the other hand, rates were relatively highest in the older age groups. Two divisions, Middle Atlantic and East South Central, were characterized by relatively high rates in the age groups 15-44.

The different pathological varieties of leukemia have different age and sex trends (12). It may be, therefore, that these age differences in rates for divisions are indicative of variations in the proportions of the different types of leukemia. On the other hand, local circumstances may affect the shape of the age trend through changes in the age-specific risks for a specific pathological diagnosis. No data permitting examination of this question are available.

### Secular Changes

To determine whether these geographic patterns have undergone any recent changes, data have been assembled for the 5 years surrounding the census of 1940 (1938-42). As mentioned previously, data on leukemia deaths in individual States are not available by age for this period, and age-standardized death rates can-

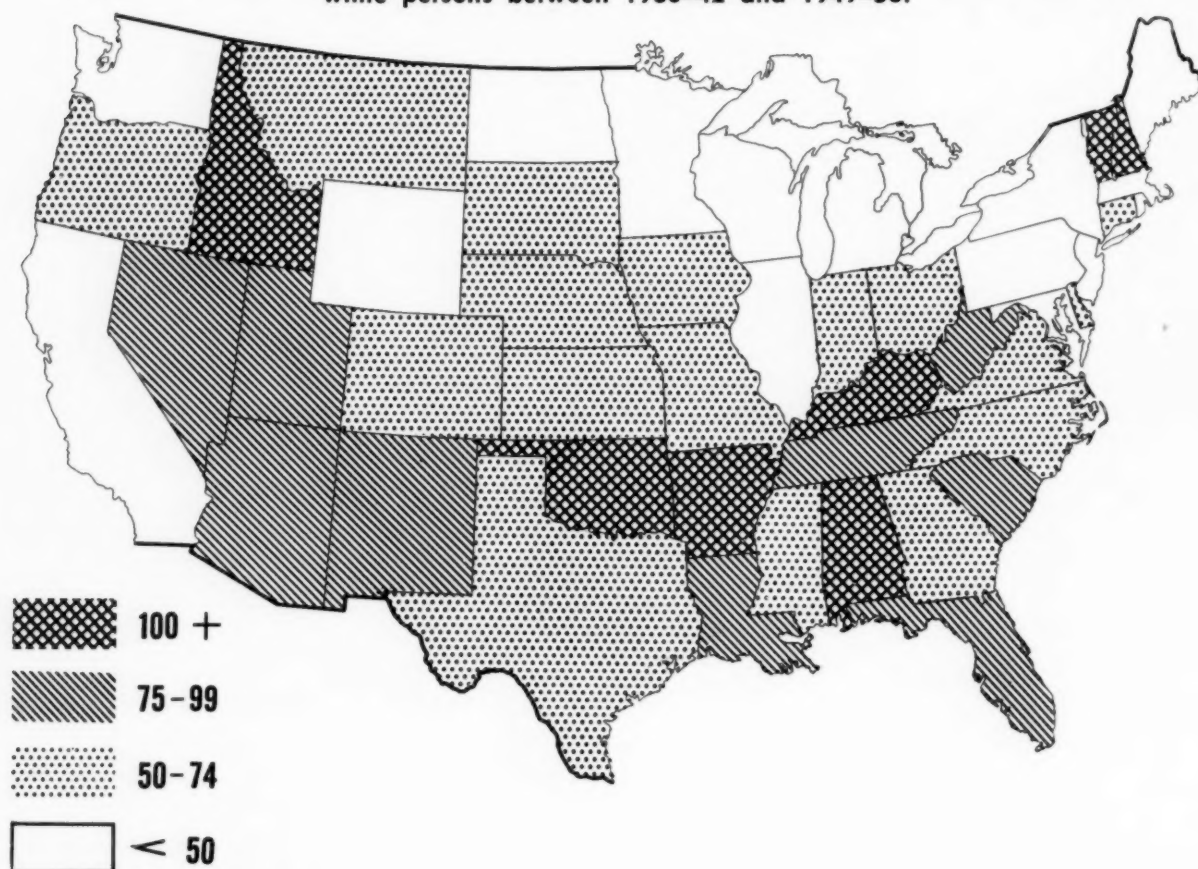
not be calculated. The measurement of secular change in mortality in individual States has therefore been approached in two ways. First, comparative mortality indexes have been calculated for each State for 1938-42, using the total age-specific and sex-specific rates of 1949-53 for the calculation of expected numbers. The increase in the index between 1938-42 and 1949-53 is then expressed as a percentage of the 1938-42 index in the same State (table 1). Second, regression lines have been fitted to the annual crude leukemia death rates in each State separately for the two periods 1938-45 and 1946-53. From these, the regression coefficient is shown as the mean annual increment in table 1. This second method does not allow for age changes in population but gives a crude measure of the rate of increase of leukemia mortality in the two halves of the time period.

In examining the comparative mortality indexes for 1938-42, we may note that the overall pattern is similar to that of the later period, 1949-53. However, there is a suggestion that the physician-income-urbanization complex was more influential in determining leukemia death rates in the early period. Coefficients of correlation of the comparative mortality indexes for 1938-42 with density of physicians and percentage of urban population in 1940 were  $0.62 \pm 0.14$  and  $0.60 \pm 0.14$ , respectively. Data on median income of the white population were not published by State for the 1940 census. The stronger association with the urbanization com-

**Table 2. Age-specific leukemia death rates in each division, as a percentage of the United States rate for the same age group, 1949-53**

Age	Pacific	West North Central	Middle Atlantic	East North Central	Mountain	New England	West South Central	South Atlantic	East South Central	Death rate per million, United States
0-4	114	101	95	106	97	99	102	89	89	58.7
5-14	126	98	105	98	103	107	92	89	87	31.7
15-24	106	101	109	99	89	101	89	88	110	20.8
25-34	107	100	111	94	107	89	93	91	111	22.5
35-44	100	103	112	98	102	85	96	89	101	33.2
45-54	103	106	104	96	98	99	96	97	97	62.3
55-64	102	105	107	99	97	97	98	89	89	129.7
65-74	108	112	103	105	102	92	92	87	88	238.7
75+	119	123	95	99	103	105	108	104	79	339.1
Total	107	105	101	98	98	96	95	90	90	64.4

Figure 2. Percentage increase in the mean annual age-standardized leukemia death rate in white persons between 1938-42 and 1949-53.



plex found in the earlier time period is largely the result of comparatively higher rates in the States in the East North Central division and lower rates in the Mountain States.

The percentage increase in leukemia between 1938-42 and 1949-53 is illustrated in figure 2. The increase in recorded death rates between the two periods was greatest in those areas in which initial rates were lowest. For the southern States, this increase may be interpreted as due to a leveling out of those factors, diagnostic or otherwise, which were responsible for the initial low rates. In two areas, however, Vermont and the Mountain States, such a leveling out cannot be accepted as the whole explanation of the high percentage increase between the two periods since the process has gone beyond the point of equalization. Vermont in 1949-53, for instance, had the second highest leukemia death rate. Similarly, of the five Mountain States with increases above

75 percent, three (Idaho, Utah, and Nevada) had rates in 1949-53 well above the national average.

The probability that the increase in leukemia death rates in certain of the Mountain States is of different origin from that observed in other States with initially low rates is further suggested by the observation that in the Mountain States the rise has affected the second half of the period almost exclusively. This is shown in the two columns of table 1 which give mean annual increments in leukemia death rate for 1938-45 and for 1946-53. In the southern States with large increases, the increase has occurred in both time periods, whereas in Utah, Arizona, Idaho, and Montana the increase has affected the second period predominantly. During 1946-53, two of these States experienced a rate of increase greater than that experienced by any other State in the same or the preceding 8-year period.

## Discussion

In the period 1949-53, the leukemia death rate recorded in certain States of the United States was more than  $1\frac{1}{2}$  times as high as that in other States. It is not to be expected that the geographic pattern should be explained in terms of any one variable or influence or even that there should be any one overall pattern. In fact, several separate trends are evident.

First, reference has been made to the partial consistency of the findings with previous reports of high leukemia incidence associated with the social complex which includes urbanization, higher income, better medical care, and more accurate diagnosis. How much of the association of leukemia with this complex is directly attributable to the last component, more accurate diagnosis, is conjectural.

The fact that leukemia death rates in the individual States were more closely correlated with physician:population ratios than with either income or urbanization suggests that diagnostic differences are important. However, the difference between the correlation coefficients for physician density and income was not significant. In addition, while close association with measures of medical care suggests, first of all, differences in diagnostic standards, the possibility mentioned elsewhere (13) that some feature of medical care is itself leukemogenic cannot be overlooked.

It is evident, however, that as a determinant of the geographic pattern of leukemia death rate, the importance of this association has diminished over the time period 1938-53. Correlation coefficients measuring the association in the period 1949-53 were almost half those for 1938-42. This is consistent with the wider distribution of medical care occurring during this period.

A second feature of the geographic pattern is the belt of relatively high leukemia death rates covering the northern half of the United States west of the Mississippi River. This belt is seen in both time periods, although it is more marked in the second. It is clearly not the result of the association with physician density or urbanization discussed in the previous paragraph; in fact it would appear to be evident in spite of this, notably, for example, in Montana and Idaho, both of which have leukemia

death rates of more than 72 per million, and only 94 and 77 physicians per 100,000 population, respectively. Highest rates in this belt were in Minnesota. In fact, in both time periods, Minnesota had the highest death rate of all the States, and by a comfortable margin. Minnesota is, of course, the seat of important medical graduate and postgraduate teaching centers. These could explain the especially high rate in this State on a diagnostic basis, but it could not account for the much wider plateau of high leukemia incidence of which the Minnesota rate is the peak. It should be noted that Minnesota as a whole has a physician:population ratio no higher than the national average.

A third area of interest centers around certain of the Mountain States, particularly Nevada, Utah, Arizona, Idaho, and Montana. The interesting feature here is not so much the present level of the death rate as its recent rate of increase. The leukemia death rate in the area covered by these States almost doubled in the 8 years 1946-53. The rate of increase in this period was high in each of these States, and in two of them (Montana and Idaho) exceeded that experienced by any other State in the same or in the preceding 8 years.

The increase is not explained by changes in the age distribution of the population although there has been considerable migration into certain of these areas during the period concerned. To what extent the increase can be attributed to improvement of diagnostic facilities is uncertain. Examination of the trends for certain other causes of death (duodenal ulcer, diabetes, cancer of the stomach, uterus, and breast), diagnosis of which is also dependent on laboratory facilities, did not reveal any short-term change during this period. Of course, this does not eliminate the possibility of changes in the specific type of facility upon which the diagnosis of leukemia depends.

In 4 of these 5 States, Eisenbud and Harley noted the greatest levels of radioactivity deposited from atomic tests in spring 1952 (14). This fact suggests at first sight the possibility that this source of radioactivity has contributed to the increase in leukemia death rates. The possibility is eliminated however by closer consideration. First, after the initial explosion in New Mexico in 1945, a relatively small one, no

tests were conducted in the United States until 1951 according to the Office of Public Information, United States Atomic Energy Commission. The upward trend in leukemia death rates commenced about 1947-48. Second, a later publication of Eisenbud and Harley showing cumulative radioactive fallout to January 1955 discloses much less correspondence to the pattern of leukemia increases than did the pattern from the single test series recorded previously (15). Third, as reviewed by the same authors, the presently available evidence suggests that the biological effect of fallout in the amounts observed is trivial.

The trend of leukemia mortality in these States in the next few years deserves continued attention.

### Summary

United States vital statistics for 1949-53 are used to compare age-standardized death rates from leukemia in the different States and divisions of the United States. Areas are also compared with respect to the increase in leukemia death rate noted since an earlier period (1938-42). The following features are noted:

1. Some of the geographic pattern of leukemia mortality is explicable in terms of the association of leukemia with urbanization, higher income, and better medical care. The importance of this association seems to have diminished in the decade between the two periods examined.

2. Independent of this, there is a belt of high leukemia death rates in States in the northern half of the country west of the Mississippi.

3. In an area covered by five contiguous Mountain States (Nevada, Utah, Arizona, Idaho, and Montana) the leukemia death rate almost doubled in the 8 years 1946-53. Two of these States individually had greater rates of increase during this period than any other State in the same or in the preceding 8 years.

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# Public Health and the People's Health

By ERNEST M. GRUENBERG, M.D., Dr.P.H.

**P**UBLIC HEALTH is part of civilization's fight for a better life. With civilization comes an organized, conscious effort to change man's relation to his physical and social environment.

Civilization's fight against disease, specifically, seeks to cheat death for a brief space and to protect man from nonfatal diseases that produce illness. This is done by inventing specific ways of preventing disease. It is strengthened by a social movement to put these inventions to work on a broad scale. The specific public health movement, 100 years old, has created responsible armies of workers and organizations to see that existing inventions are applied and new inventions are made.

The three main forces affecting the level of a people's health are the natural hazards to survival and their distribution, the level of civilization, and the advance of public health.

The history of man's health, which still remains to be written, will describe what is known about the milleniums during which man was at the mercy of natural hazards with little understanding of what they were and with no effective means of acting against them.

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The next great period will deal with advancing civilization and the increasing effect of technology on raising living standards and averting famines.

The past century accelerated the advance of public health. Simultaneous with the development of techniques for organized health campaigns, public health movements have become pandemic in Europe and North America. Knowledge has been increasing at a phenomenal rate, giving public health ever more powerful weapons. This new power will raise new responsibilities and require repeated self-examination regarding their nature.

In Ceylon, life expectancy at birth gained nearly a year per year for the 6 years beginning in 1947. A similar rapid rise in life expectancy occurred also in Japan and Puerto Rico while in some other areas, although more favorably situated, populations have not shown such dramatic changes (1).

One implication of these phenomenal successes is that whereas public health formerly represented a late stage in technical development, working effectively to supplement industrialization and to mitigate the harmful consequences of urbanization, new knowledge has made it so powerful that it can precede other forms of social progress.

Another implication is that, while advances in health have often served to assist the process of social development, public health never before had the power to create radically new patterns of disease and mortality, relatively unassisted by general rises in the level of living.

In some places health protection and promotion have become the chief instruments for producing rises in the level of living and in releasing uncounted millions of lives for productive labor.

To the epidemiologist this means that the distribution of organized health movements has become the chief factor in understanding the distribution of many diseases and the pattern of human mortality.

### Charting the Future

These and other signs of the power of organized public health are so much on our minds, and respect for its power to effect changes in the people's health is so widespread, that the whole movement seems to be circling in a moderately dazed way in an attempt to find suitable targets on which to strike.

There are dangers in this situation. An example is the mental health movement which, since the war, has come into its own. Although to the administrator popularity may be a matter of envy, to the serious worker it soon becomes a matter of concern.

There is a danger that we come to believe that such popularity must be deserved.

There is a danger that we come to believe our enthusiastic supporters when they claim that we are capable of anything.

There is a danger that we allow ourselves to be held responsible for things we cannot do.

In a time when our power has increased we must remember our duty to inform the public of the sober realities of their health situation. Public health workers have always been long on faith and enthusiasm and at times short on facts and self-criticism. With the powerful weapons that are now available and the widespread faith and enthusiasm that are evident, the movement needs to strengthen its balance wheel of facts and self-criticism.

The suggestion that the next great chapter in public health should be centered on positive health and medical care can be misleading.

Medical care has become a powerful tool for reducing disability and postponing death in the presence of certain diseases. Furthermore, everyone has the right to expect the best available medical care when he is ill.

But, from the public health point of view, every case that comes to medical care represents a failure of a movement whose objective is to keep illness from occurring. Obviously, physicians in this country keep very busy in

spite of preventive medicine's great successes. Public health will not be doing its job unless it tackles the causes of morbidity and mortality which still plague the people.

### Attacking Preventable Diseases

First, we must do what we know how to do. There are some vital gaps in civilization's battle against disease.

We have not found practicable ways of preventing all preventable diseases, diseases for which the technical means of prevention are well established. The great progress on which we compliment ourselves has affected a pitifully small percentage of the world's population. Malaria alone, a completely preventable disease, is still a great killer.

It is not only abroad that these gaps are to be found. Malnutrition, tuberculosis, venereal disease, excess infant and maternal mortality, and inadequate medical care and rehabilitation are often found in the United States in particular neighborhoods and sections of the population. Infant mortality in New York City, for example, is as high as 35 per 1,000 live births in 4 districts and as low as 17 in some districts of the city (2).

Retarded populations in this country suffer not only from poor health but also from poverty or ignorance. If public health is going to continue to work for the improvement of the people's health, it will concentrate on these populations.

One useful approach is the examination of patterns of differential mortality rates. Although we are working toward consistency and constancy in statistics on occupation and mortality, England has issued tabulations of mortality by social classes for several generations. While we have failed, perhaps, to be impressed by the fact that the standardized mortality ratio for the least favored populations in England and Wales is twice as high as for the most favored, we should be impressed by the fact that age-specific death rates for adult males are higher for each comparable age group in this country than in England. And we should be even more impressed by the fact that standardized mortality ratios vary more by occupational groups in this country than in England (3).

This is not the place to recommend solutions. It is important to recognize that these problems exist and that the measures available point unmistakably to unfinished business for public health.

Some of the specific areas for attention which might lead to a reduction of some of these differentials are well known. To list a few:

- Nutrition is not optimal for the entire population.
- Housing is not sanitary or safe for all.
- Fluoridated water is not yet available to most urban families.
- Medical care is not readily available to those who need it most. In particular, the aged frequently cannot afford the high costs of medical and nursing care. Often they do not receive the detailed attention that medical science can offer to preserve remaining functions.

Dr. Haven Emerson once propounded the theorem that the first step in public health occurred when man rose up out of his own filth. Although mankind has long since passed that early stage, it now finds itself surrounded by man's collective filth in air and water. The present movement to rid rivers, coasts, and city air of man-made pollution has scored some signal successes on a few small fronts. The staggering proportions of the problem and its implications for civilized life illustrate the old proposition that public health cannot "go it alone" but must act as a center of technical and community leadership for all the forces interested in the people's health and welfare.

### Using Knowledge Fully

There are also some new frontiers for public health. Four major health problems—mental diseases, arteriosclerosis, cancer, and the common cold—serve to remind us that there are still diseases we do not know how to control and that there are some public health objectives we would like to reach but do not know how.

A proper humility before the forces of nature obliges us to recognize that we are powerless to prevent these conditions in the mass and that medical science can do little to change the course of most of these diseases once they are started on their way.

Our first obligation as professional health

workers is to know the facts. Our second is to communicate them intelligibly to the people we serve. Our third is to devise and execute schemes to put the limited knowledge we do have to effective use.

For example, though many prevention programs have been instituted in the mental diseases, most have ignored established knowledge.

In one State the mental health program is centered on human relations in the health department and in the schools. Some cases of pellagra psychosis occur each year, but the program does not consider control of these preventable cases to be its function. Nor does it concern itself with the preventable cases of neonatal brain hemorrhage caused by Rh incompatibility. Available knowledge strongly suggests that young infants and preschool children require stable family life for healthy personality development, but the program does not seek to prevent preschool children from being housed and fed in institutions or in a series of foster homes.

It would seem that the first item on any public health program must be the elimination of preventable instances of morbidity and mortality. But the bulk of mental illness today cannot be prevented by known techniques.

Can we shorten the duration of some mental cases? There is some reason for hope in this direction. Acute depressions in the involutional years are sensitive to shock treatments. Some neuroses of childhood seem to be relieved by quick responses by the adults in the child's environment. Mental deficiency is partly treatable.

Can we reduce the disability which mental illness produces? In many instances, yes. We know that we overhospitalize mental illnesses in a wanton fashion. We know that with good medical care many chronically ill people can live slightly impaired lives instead of hospitalized lives.

Programs which emphasize positive mental health often distract attention from the pluses and minuses in our knowledge. Mental health programs emphasize child guidance clinics, but the clinics generally prefer to see chronic neuroses rather than to try to see an acute neurosis while it is acute or to help a neglected infant. Programs emphasize building more hospitals

when the use of mental hospitals has become excessive. Psychiatrists are trained to treat the least ill rather than the chronically ill whose disability they could often reduce. Education programs are called preventive even when there is no real reason for believing they have any important preventive effects.

### Avoiding Illusions

Parent education is necessary within reason, and child guidance clinics, adult psychiatric clinics, mental hospitals, psychotherapy for neuroses are both necessary and valuable. Perhaps the emphasis on these activities in existing mental health programs comes from an illusory kind of thinking. Some of these illusions have become our standard ways of avoiding unpleasant realities. To describe a few:

"Where there is a will, there is a way." This is true about carrying out an activity, but it is not true about achieving an objective. You may shout across the ocean with great will, but without a radio you will not be heard. You may educate parents with gusto, but you cannot be sure you have prevented any mental disease.

"Early diagnosis and treatment is secondary prevention because it shortens disease or reduces disability." This is a simple inversion of the true proposition that secondary prevention consists of early diagnosis and effective treatment. Ineffective treatment doesn't help arteriosclerosis. There is no real reason to think that early diagnosis and treatment can reduce morbidity or mortality in this disease.

"Activity is good." It isn't always.

"If one clinic doesn't help, get two." If one super anticold pill doesn't stop your cold, take two. If two don't help, take three.

"Doctrine of signs and names." This illusion consists of the belief that the name of an agency describes its effects. To stop the common cold, set up an anticold commission and give it the assignment of stopping colds. If the incidence of colds goes up the first year, enlarge the agency the second. After staff has obtained tenure and the rates are still rising, have a shakeup, change the name, and bring in a director who has impressive qualifications. The chances are that you will get a competent staff who think the common cold is a bad thing,

who will probably find ways of reducing the amount of headaches and coryza, who may produce some skin-tanned children by lighting classrooms with ultraviolet lights, and who will increase the sale of nasal paper tissues, and decrease the sale of pocket handkerchiefs. They will keep busy and do some useful things, but they probably won't have much effect on the number of people who suffer from the common cold.

The reason is obvious: They don't have the knowledge; they don't have the techniques. In spite of good scientific training in tailoring means to fit ends and in learning to recognize facts as facts, the best intentioned of us get carried away by the desire to effect changes, to slay the wicked dragons. When ignorance or difficulties frustrate, we switch goals and develop formulas for self-justification.

These are some of the current thoughts of one mental health worker regarding the future of public health. The objective of public health work is to control disease. The value of public health activity depends entirely on its success in achieving that objective. As techniques become more powerful and as health organizations become larger, the responsibility for keeping track of our successes and failures becomes greater.

The successes of the past can guide us, but the successes of the future will be even greater and will demand as much originality and steadfastness from public health workers.

The people's health is becoming increasingly more subject to the control of public health, but the people's health still manages to vary in ways which public health has not yet been able to control.

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# Epidemiological Methods and Inferences in Studies of Noninfectious Diseases

By ABRAHAM M. LILIENTFELD, M.D., M.P.H.

**D**URING THE PAST FEW YEARS, the epidemiological approach has been applied increasingly to the study of noninfectious diseases, such as cancer and heart disease. Various methods of study have been used, and various inferences have been derived from the observations. In several instances, such as the relationship between lung cancer and cigarette smoking, the inferences have provoked considerable discussion. This in turn has led to consideration of certain selected aspects of the conceptual framework of these inferences (1-5). However, there still exists a need for a more general review of the methodology and of the considerations that may influence the derivation of inferences from the observations. This paper intends to provide such a review, although it does not pretend to cover all aspects of the subject. This review may give perspective on some of the issues involved. It may stimulate further discussion and investigation so that the methodological problems confronting us can be gradually resolved.

## Uses and Sources of Data

Epidemiology may be defined as the study of the distribution of a disease or condition in a population and of the factors that influence this distribution. Thus, the epidemiologist is in-

terested in variations in frequency of diseases by such characteristics as age, sex, race, social class, and occupation. This knowledge is useful for the following reasons:

1. It permits the development of hypotheses concerning etiological factors. Thus, if the disease is observed to be more frequent in a particular population segment than in others, hypotheses are developed to explain this increased frequency.

2. It can be used to test hypotheses developed in the laboratory or clinic. It is important to determine if an etiological hypothesis, based on laboratory or clinical observations, is consistent with the known distribution of the disease in human populations; to the extent that it is not consistent, the hypothesis will have to be modified.

3. It provides the scientific basis for public health administrative measures to control the disease. Even if knowledge of etiological factors is inconclusive or erroneous, epidemiological data may still be used for such control measures as case finding and the early detection of affected individuals.

The present discussion will be concerned principally with the use of epidemiological observations to elucidate etiological factors.

An epidemiological study provides data from which may be derived a series of statistical associations between a disease and various characteristics of the population. From this pattern of statistical associations, biological inferences may be drawn. The totality of the associations and the inferences constitutes the epidemiology of a disease. Thus, the epidemiological method consists of two stages: first, the

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determination of one or more statistical associations; second, the derivation of inferences or hypotheses from the series of associations.

Two distinct types of studies are used to determine statistical associations: studies of demographic data and studies of individual history data. The latter may be divided into three general categories: retrospective studies, prospective studies, and experimental studies. Of these latter, only the first two will be examined in this review. Both of these concern observations of naturally occurring phenomena, and the investigator has no direct control over other possible factors that may influence the associations so determined. Properly designed human experiments are the only certain way of establishing an association between a disease and a characteristic. However, opportunities for carrying out such studies are rare.

### **Demographic Studies**

Demographic data are obtained principally from routinely collected vital statistics reports. They provide information concerning the distribution of either mortality or reported cases in time, by age, sex, race, social class, and other characteristics. Such data may differ from data based on individual histories in several respects. For example, demographic data may show an association between two events in time, whereas individual history data may show that an individual with a certain characteristic also has another characteristic; the latter is more likely to reflect a biological relationship. Also, certain demographic data, such as socioeconomic data, may deal with average characteristics of a group of individuals rather than with the characteristics of each individual.

Associations based on demographic data are of value in furnishing a lead for more detailed investigations. However, they must be interpreted with caution because of questions concerning the accuracy of death certification, reporting practices, and the like. General familiarity with demographic data makes further discussion unnecessary.

### **Retrospective Studies**

The retrospective approach consists of obtaining a group of individuals with the disease,

which we shall call B, and determining the percentage of these individuals who have the characteristic A, which is considered a possible etiological factor. This frequency is then compared with a similar frequency in a so-called control or comparative group of individuals without the disease. If the frequency of A is higher among those with B than among those without B, an association is said to exist between A and B. In such studies, the cases (with B) and the controls (without B) can be selected in several ways.

### *Hospital Populations*

Most frequently, both the cases and the controls are obtained from hospital populations. Practically all the retrospective studies indicating an association between lung cancer and cigarette smoking have been hospital studies. Control groups usually consist of patients with other diseases admitted to the same hospital or hospitals. This method's popularity results from the ease and inexpensiveness with which data can be obtained. In evaluating this method, several factors must be considered and their relative importance judged by the investigator.

Probably the most frequent problem encountered in studies of hospital populations results from the influence of what is termed "selection." In this connection, it will be helpful to distinguish "sampling selection" and "biological selection." When selection is discussed in this type of study, sampling selection is usually meant. The question of biological selection will be considered later. Berkson has shown the possibility of obtaining a spurious association of A and B because of sampling selection resulting from differential rates of admission to the hospital of individuals with A, those with B, and those without B (6). However, Berkson (6) and Kraus (7) have also indicated that if characteristic A does not influence the admission of individuals to the hospital, the likelihood of a spurious association is negligible.

Decision as to whether A does or does not influence admission to a hospital may at times be difficult. To a large extent, we are dependent on the judgment of the investigator and on our general knowledge of the specific situation,

making evaluation of the results difficult. In many instances we may feel that a specific characteristic A does not influence hospitalization, but this may result from ignorance of all of the related variables involved. For example, if we are interested in determining a possible relationship between eye color and a specific disease, and we find an association between blue eyes and a disease in a hospitalized series of cases and controls, it does not appear likely that individuals with blue eyes would be selected for hospitalization. However, if we are in a community in which the ethnic group with blue eyes is predominantly in the lower social strata and if social class influences hospitalization, it is possible that sampling selection may operate to such an extent as to result in a spurious association of a disease with blue eyes.

In determining the importance to be assigned to the influence of sampling selection, another factor that must be considered is the strength of the observed association. In the extreme case, if we find that all the B individuals have A and all the non-B individuals do not have A, it would be very difficult to deny the existence of an association between A and B, unless the characteristic A exerts an unusually large influence on the chances of hospitalization. Unfortunately, most associations are not this strong. Hence, it may be helpful to judge the relative importance of sampling selection by determining arithmetically how much of an association could be expected for varying degrees of sampling selection; we shall illustrate this in our discussion of prospective studies. If the degree of the association is much greater than could be expected after taking into account what may be considered a reasonable influence of sampling selection, the association may be more readily accepted. Objections to this approach might be raised since it is not as clear cut as is usually deemed desirable. However, an element of judgment is always present in the evaluation of any set of data, regardless of the source.

In many hospital studies, confidence in an observed association may be increased by the presence of internal evidence. For example, if several non-B groups, each with a different disease or condition, are compared with the B group and the results with regard to character-

istic A are similar, confidence in the existence of an association can be greater than if only one non-B group is used. Also, confidence may be greater if there is a relationship between the frequency of B and the amount of A, provided that A can be quantified. In general, the more ways in which an association can be shown, the greater can be our confidence that it is a real one and not a result of such a disturbing factor as sampling selection.

Clearly, the determination of a statistical association by hospital studies poses many difficult problems, since an interpretation concerning the existence of a relationship depends largely on the investigator's judgment regarding the plausibility of other explanations for the observed association. A point frequently overlooked is that disturbing factors actually may operate in the opposite direction so that a true association is obscured as a result of sampling selection. One might argue that this situation would occur only if the association were not a very strong one and, therefore, not very important. However, in seeking clues about etiological factors, no possible associations should be overlooked.

#### *Controls From General Population*

A modification of the hospital studies is the use of a control group selected from the general population and matched with the hospitalized cases according to certain characteristics. Usually, such a control group consists of individuals who reside in the same area and are similar in age, sex, and race to the hospitalized cases. A matched population control may diminish some of the difficulties resulting from the possible disturbing effect of sampling selection, but it is not completely clear as to how much really is accomplished. It is principally on intuitive grounds that such a control is regarded as better than a hospital control.

In some situations it is possible that a matched population control group is worse than a hospital control group. If characteristic A is another disease or condition requiring medical diagnosis for its determination, the objection could be raised that matched population controls differ from hospitalized patients with regard to the amount of medical care received. For example, in studying the association of can-

cer of the cervix with diabetes, we would carry out a retrospective study with hospitalized cervix cancer patients from whom we obtain a history of diabetes. A matched population control may be completely inadequate for comparison with the patients since the patients and controls would differ with regard to the amount of medical care received, and, therefore, the matched control group may actually have a larger proportion of undiagnosed cases of diabetes. This situation will arise if the information concerning diabetes is obtained by interview. However, if the presence of diabetes is determined by examination, this difficulty will not be encountered. Consequently, if it is necessary to obtain the required information by interview it may be preferable, in certain instances, to use hospitalized patients as the controls.

A control group for comparison with a hospital case group can also be obtained by selecting a random sample of the population and adjusting for differences in sex, race, age, and other variables by available statistical techniques. The question of whether to use matched or randomly selected controls has been discussed most recently by Cochran (8) and Greenberg (9). Apparently, each method has certain advantages and disadvantages, with the random sample having a slight edge. The problem of diagnostic comparability mentioned in the case of matched population controls also occurs with regard to a random sample control group.

#### *Cases and Controls From General Population*

To avoid problems imposed by sampling selection, the best approach would seem to be to obtain a sample of all cases in a community and to select either a matched or random sample of the general population as a control group. However, when samples of the general population are used, the cases and controls are again not comparable from the viewpoint of medical care. Consequently, if we are interested in determining the frequency of a characteristic that is influenced by the amount of medical care received, a more appropriate method of determining this characteristic than interviewing must be used. Selection of cases and controls from the general population appears preferable to other methods of selection in that, with this

method, it is least necessary to depend on judgment concerning the relative weight to be assigned to the influence of sampling selection and other possible disturbing factors.

It is remarkable that this kind of study has not been used in epidemiological investigations of noninfectious disease more frequently than it has. The only drawback is that such studies are more difficult, expensive, and time-consuming than studies of hospitalized cases. Despite the obvious advantages, it must be admitted that theoretically this method does not avoid all possibility of sampling selection, since it might be argued that "all cases" includes only "all known cases" and undiagnosed or asymptomatic cases may have been selectively omitted with respect to the variable under study. After hospital studies have indicated the existence of associations, it would appear more profitable to expend funds and energies on confirmation by general population studies than to continue repeating hospital studies ad infinitum.

#### *Additional Considerations*

In retrospective studies, information is usually obtained by interview. Interviewing as a method of measurement has a fair amount of error, which, among other things, results in a certain amount of misclassification of individuals with and without the characteristic under study. Bross has pointed out that the ability to detect differences in the frequency of a characteristic in two groups decreases with increasing amount of misclassification (10). Thus, in retrospective studies, where there always will be some degree of misclassification, there is a certain risk that a true association will not be detected. This lack of sensitivity has not been sufficiently realized. In addition, the possible intrusion of subjective bias, both conscious and unconscious, must not be overlooked. When a history of a characteristic is obtained and the interviewer knows which individuals are the cases and which the controls, it is difficult to be certain that the differences observed between the two groups are not the result of subjective bias.

Retrospectively obtained data can be further evaluated by noting if the results are consistent with those obtained by demographic studies. Consistent findings will increase the confidence in the existence of observed associations, but it

is difficult to determine the degree by which such confidence will or should be increased.

### **Prospective Studies**

In prospective, or followup, studies groups of individuals with and without the characteristic A are obtained and followed for a definite period of time to determine the risk of developing B when the characteristic A is present as compared with the risk when it is absent. These groups may be selected from the population in either a random or a nonrandom manner. Several practical considerations must be taken into account in the actual process of selection. For example, if the characteristic A is very frequent in the population, a completely random sample of the population may not be the most efficient method of selecting the two groups, since the number of individuals without A in a random sample may be too small. To increase the number of individuals without A, it may be necessary to select more of them from the rest of the population by matching with the individuals with A in the random sample. A similar situation may occur with an infrequent characteristic. If we are interested in prospectively studying the association of diabetes with cancer of the cervix, it would probably be best to select a random sample of diabetic patients in the community. Then we could select either a matched control group of nondiabetics or a random sample of the entire population from which we could obtain a control group of nondiabetics by further sampling and perhaps matching. In general, the method of selection depends largely on the particular characteristics being studied.

If a nonrandom sample is used, sampling selection may be a disturbing factor. Berkson indicated this possibility in an analysis of some of the prospective studies of the association of cigarette smoking with lung cancer (11). In these studies, nonrandomly selected groups of smokers and nonsmokers were followed for a certain period of time, and it was observed that the death rate from lung cancer was higher among smokers than among nonsmokers. By numerical illustration, Berkson demonstrated that sampling selection may produce a spurious association. From other sources, he obtained

estimates on the frequency of smokers in the population. This frequency was different from that in the study population, indicating that sampling selection had taken place. Berkson then demonstrated that this degree of sampling selection would result in a lung cancer death rate among smokers that was 1.5 times that found among nonsmokers. However, according to a report on the prospective studies by E. C. Hammond, the observed rates among smokers in the 4 age groups studied are from 3 to 17 times the rates observed among nonsmokers. For such a difference to be a result of sampling selection, it would be necessary to assume a degree of selection that apparently was not present in these studies. This example is presented to indicate the need for evaluating the strength of the association in relation to the degree of sampling selection that could have occurred. As in the case of retrospective studies, judgment must be exercised in the evaluation of the data.

The followup method of study has several advantages. First, it provides a direct estimate of the risk of developing the disease B when A is present, whereas in the retrospective method this can only be obtained indirectly. It is not certain how advantageous this really is when the major objective is to try to determine possible etiological factors. But some investigators prefer direct rather than indirect estimates. Second, a prospective study decreases the risk of subjective bias, provided that the criteria and procedures are established in advance. Third, it decreases the likelihood of misclassifying individuals with and without the characteristic. For example, in determining the relationship of artificial menopause to female breast cancer retrospectively, we are dependent on a history of artificial menopause. In a certain proportion of cases the history would be erroneous. However, in a prospective study we would start with individuals who currently have an artificial menopause; therefore, there would be no misclassification of these individuals. This tends to increase the chances of finding an association if one actually exists.

### **Observations to Increase Confidence**

In either a retrospective or a prospective study, confidence in observed associations may

be increased by including individuals who had characteristic A initially and then lost it. For example, in the studies on cigarette smoking and lung cancer, there were individuals who had been smokers and then had become nonsmokers. Therefore, it is possible not only to compare cigarette smokers and nonsmokers with regard to the risk of developing lung cancer, but also to determine the risk for individuals who were smokers and then became nonsmokers. E. C. Hammond reported that for this group the risk of lung cancer is less than for those who remained smokers. This is a valuable observation since it is less likely that such factors as sampling selection are responsible for this type of an association.

Additional confidence in the observed associations may be obtained also by comparing the affected groups and controls or those with a characteristic and without a characteristic with regard to as many other variables as possible. On the question of smoking and lung cancer, it would be of considerable interest to see if smokers and nonsmokers and if the lung cancer cases and the control groups are alike with regard to such characteristics as alcohol consumption, family size, occupation, and the like. Except for occupation, such comparisons are not yet available. This is one major methodological criticism that could be leveled at lung cancer studies. The more characteristics with regard to which the groups are similar, the more certain can one be that the difference with regard to smoking habits is real. However, the present level of epidemiological knowledge sets a limit in determining the characteristics to be selected for comparison. There is a risk of stating that the two groups are comparable with regard to characteristics that may eventually turn out to be unimportant. As knowledge of the epidemiology of a disease increases, it can be used continuously to evaluate more properly previously determined associations.

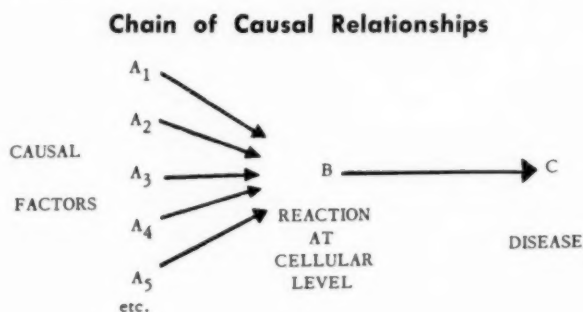
### Causality in Biological Phenomena

After a statistical association has been ascertained, we would like to make some sort of an inference as to whether a cause and effect relationship exists between the disease and the associated characteristic. Before discussing fac-

tors that influence this type of inference, we need to consider the concept of causality.

In medicine and public health it seems reasonable to adopt a pragmatic concept of causality. One major reason for determining etiological factors of human disease is to use this knowledge to prevent the disease. Therefore, a factor may be defined as a cause of a disease, if the incidence of the disease is diminished when exposure to this factor is likewise diminished.

This concept is not as logically rigorous as the more formalistic one held by some investigators, which requires evidence indicating that a factor is both a necessary and a sufficient condition for a disease before it is incriminated as a cause. In biological phenomena, both these requirements do not have to be met because of the existence of multiple causative factors. For example, in tuberculosis, the tubercle bacillus is a necessary but not a sufficient condition for tuberculosis. Other additional factors included under the term "susceptibility" are important. In other infectious diseases, the micro-organism is a necessary factor but not always a sufficient one. In diseases generally considered as noninfectious, such as cancer, the concept of causation may have to be broadened further, since one particular etiological factor may not even be a necessary one because of the probable existence of multiple causative agents.



Actually, in both infectious and noninfectious diseases the differences in these two concepts of causality depend upon the frame of reference. To illustrate, the cause and effect relationships with multiple etiological factors, labeled  $A_1$ ,  $A_2$ ,  $A_3$ , and so forth, each acting independently, are presented in the accompanying drawing. These factors can be looked on as producing a change

in B at a cellular level. The changed cell B could then develop into C, the disease. Clearly, the cellular change in B can be considered as the necessary and sufficient condition for the disease C. Therefore, to meet the more rigorous definition of causality, the biological mechanisms relating A to B and B to C must be determined. Pragmatically, however, the determination of each of the A factors is important, since attention must be focused on these to be able to apply preventive measures.

The derivation of causal inferences from observed statistical associations is difficult because of the inability to eliminate the possible effect of another variable that may influence both the characteristic A and disease B. For example, in the cigarette smoking-lung cancer relationship, it is possible to postulate the existence of another factor that causes a person to smoke and also causes lung cancer. Or perhaps there exists some constitutional factor among non-smokers that decreases their risk of developing lung cancer. The latter viewpoint is not unreasonable since there is a tendency for persons participating in athletics not to start smoking at that time of life when smoking habits are developed. Such individuals may be constitutionally harder as shown by their participation in athletics, and perhaps this constitutional factor decreases their risk of developing lung cancer. If such relationships exist, they would result in a statistical association without a causal relationship. This situation may be termed biological selection since individuals are selected for both the characteristic and the disease by a third mutually related factor. Similar problems are encountered in many fields, such as genetics and sociology (12,13).

### Biological Considerations

One important biological consideration that may influence the derivation of causal inferences concerns the ability to experiment. If one can select samples of individuals from a population and randomly allocate them to two groups, one with and the other without the characteristic, and the statistical association continues to exist, the randomization procedure has taken into account most, if not all, of the other related variables. Such well-controlled

experiments had a major role in establishing a causal connection between fluorides in drinking water and reduction in dental caries. However, experimentation is not usually feasible in most human diseases.

Another influential factor is the degree of the observed association. If the statistical association is very strong, it is less reasonable to suppose that a mutually correlated third factor was involved. Admittedly, a 100 percent association does not completely eliminate the possible existence of a third factor, but it does make such a possibility more unlikely. Here again, such a situation is rarely encountered.

Probably the most important consideration is whether or not the association is consistent with existing biological theory. If a statistical association makes biological sense, it is more readily accepted than one that is at the moment not capable of biological explanation. By "biological sense" we mean that the mechanisms leading from the characteristic A to the disease B fit into some biological (physiological or pathological) framework. If this framework exists, it was probably derived from other kinds of observations; therefore, it is intuitively felt that the association has been verified by other, independent observations.

This type of reasoning can be illustrated from studies of pregnancy experience and neuropsychiatric disorders in childhood (14). In these studies an association was demonstrated between certain maternal factors during pregnancy and the development of such disorders as cerebral palsy, epilepsy, and mental deficiency in the offspring. This association fits into a reasonable biological framework since the mechanisms of such relationships are readily conceived. These same factors have been shown to produce anoxia in the fetus, and anoxia may result in damage to the brain, which, in turn, is logically related to the disorders mentioned. Consequently, the statistical association is readily acceptable as a causal hypothesis.

On the other hand, in the association of cigarette smoking and lung cancer, no direct links between cigarette smoking and cancer have been worked out. There is evidence indicating that environmental agents are important in the etiology of cancer, which does strengthen the hypothesis that cigarette smoking and lung

cancer are causally related. It also seems more reasonable to accept cigarette smoking as a causal factor than the application of a certain ointment to one's feet or the ingestion of alcohol, since cigarette smoke does come in contact with the site of lung cancer. But the biological plausibility of a causal hypothesis on these two bases is not of the same order as in the case of pregnancy factors and neuropsychiatric disorders.

There are historical instances in which a statistical association did not originally conform to existing biological concepts. As advances in knowledge changed the biological concepts, these new concepts were found to be consistent with the previously observed association. Conversely, there have been instances in which the statistical association was interpreted as being consistent with existing biological concepts, but later the interpretation of the association was found to have been erroneous.

The classical example of the first situation is afforded by Snow's investigation of cholera (15). Snow observed an association between the ingestion of polluted water and the development of cholera during 1849-54. At that time, prior to the establishment of the germ theory of disease, the accepted etiological hypothesis for cholera was the miasmatic theory. Snow's observations were not generally accepted since they did not conform to the miasmatic theory. After the germ theory of disease was established, Snow's statistical association was consistent with the germ theory, and, hence, it was accepted. Thus, the prevailing biological opinion was erroneous whereas the inference made from the statistical association was not.

The second situation is exemplified by Farr's observation of an association between elevation of residence above sea level and cholera mortality in London (16); his data, for 1848-49, are shown below. With increasing elevation, there was a decline in cholera mortality. This association was consistent with the miasmatic theory and was interpreted as confirmatory evidence. When the miasmatic theory was replaced by the germ theory, this association was still reasonable since elevation was in turn inversely associated with the etiological factor, polluted water.

<i>Elevation above sea level, in feet</i>	<i>Deaths in 10,000 inhabitants</i>
Under 20-----	102
20-40-----	65
40-60-----	34
60-80-----	27
80-100-----	22
100-120-----	17
340-360-----	7

One other biological consideration is the role of animal experimentation. There is a widespread feeling that, if a statistical association is confirmed by an animal experiment, definite proof of a cause and effect relationship in humans is established. It is important to realize that applications of the results of animal experiments to human situations are fraught with danger. If we are concerned with such disturbing influences as sampling and biological selection in studies of humans, we should be so much the more careful of basing conclusions on results of animal experiments. Confirmation by animal experimentation increases the biological reasonableness of a causal inference. It also provides an animal model by which possible biological mechanisms may be elucidated, thereby indicating how and where such mechanisms might be investigated in humans. But, in interpreting results from animal experiments, it is important to distinguish between definite proof and increased biological plausibility.

### **Nonbiological Considerations**

Certain nonbiological considerations may influence an individual's attitude toward acceptance of a causal inference. These concern the decisions that are made relative to the course of action to be taken when an inference is accepted. They reflect the outlook, background, and administrative responsibilities of the individual. For example, a research scientist, without any direct responsibility for the health of a population, might require a very high degree of plausibility before accepting a causal inference and recommending definite administrative action. On the other hand, a health officer, directly responsible for the health of a population, may accept a lower degree of plausibility as sufficient to warrant preventive action. He may therefore accept a causal inference when he thinks that it has a good chance of being correct but before it is definitely proved.

Such considerations usually play a role after the statistical association is established and before a causal relationship is definitely proved. During this period, causal inferences are regarded with varying degrees of plausibility. It is helpful to consider the possible relationships between courses of action and degrees of plausibility, as follows: At the first level, the evidence is considered sufficiently suggestive to warrant further investigation. At the second level, the evidence is considered sufficient for recommending attempted preventive action. At the third level, the evidence is considered sufficient to state that a causal inference has been proved, and this causal hypothesis is included in our body of scientific knowledge. There is an interaction between the degree of plausibility with which an inference is regarded and the actions based on these inferences.

It seems that the present controversy over the inferences from the cigarette smoking-lung cancer association is largely concerned with the degree of plausibility. It is generally agreed that the evidence is sufficiently suggestive to warrant further investigation. At the other extreme, there is general agreement that the evidence is not sufficient to warrant a statement that a causal hypothesis is definitely proved; this level will not be reached until the detailed biological and chemical mechanisms have been worked out. At present, the major issue is whether a causal inference is sufficiently plausible for a public statement that cessation of cigarette smoking would diminish the risk of acquiring lung cancer. Since the degree of plausibility cannot be directly assessed, differences of opinion naturally develop.

In evaluating these decision levels, it is important to keep in mind that in many instances action based on a statistical association could be successful even though it is interpreted incorrectly from a biological viewpoint. To illustrate this we recall Farr's observation of the association of decreasing cholera mortality with increasing elevation of residence above sea level (16). If the health officer had recommended that people living in the lower-lying districts of London move to the higher districts, a decline in cholera mortality would probably have resulted, although such action would have been based on the erroneous miasmatic theory.

## Summary

Increasing use of the epidemiological approach in the study of noninfectious diseases emphasizes the need for considering the conceptual framework of such studies. Epidemiological studies are composed of two stages: first, the determination of statistical associations between a disease and various population characteristics; second, the derivation of biological inferences from the pattern of associations. Both the associations and inferences constitute the epidemiology of the disease.

Statistical associations may be determined from demographic data or from individual history data. The latter may be obtained from retrospective studies, prospective studies, or experimental studies. In these studies, characteristics of a group of cases are compared with those of one or more groups of controls. Cases and controls may be selected by various methods, each of which has advantages and disadvantages.

In general, leads to the existence of statistical associations come from individual history studies of hospital populations or from demographic data. The associations so suggested require confirmation by retrospective studies of adequately selected samples of cases and controls from their respective populations. Whether or not prospective studies are necessary depends largely on the kind and strength of the association. The method of carrying out a prospective study depends on the nature of the characteristics and the disease under investigation.

In the derivation of causal inferences from observed statistical associations, certain biological and nonbiological factors are influential. Among the biological factors are the ability to conduct human experiments, the strength of the association, the role of animal experimentation, and the prevailing biological concepts. The latter is the most important. Snow's and Farr's observations on cholera are illustrations of the interaction between biological theory and the interpretation of statistical associations. A nonbiological factor is the course of action resulting from the degree of plausibility with which a causal inference is regarded. This factor, directly or indirectly, influences an in-

dividual's basic way of thinking about causal relationships.

We hope that this brief review of some of the methodological and inferential problems encountered in epidemiological studies will stimulate further discussion. There exists a compelling need for establishing some general principles which would provide a logical framework for future investigators.

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### CDC Course in Epidemiology for Nurses

A refresher course for nurses in communicable disease control will be given by the Communicable Disease Center, Public Health Service, Atlanta, Ga., from April 8 through April 26, 1957. The course is open to public health nurses and educational directors, industrial nurses, and instructors and consultants in nursing.

Designed to increase nurses' technical knowledge and skills in the prevention and control of communicable diseases, the course will stress epidemiological principles and techniques.

Supervised practice in the field may be arranged for a limited number of students after the termination of the course.

Applications must be filed with the Communicable Disease Center by March 10, 1957. Information and application forms may be obtained from the director of public health nursing in a State health department or from the Chief, Nursing Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street, NE., Atlanta, Ga.

# Personnel Shortages in the Health Field and Working Patterns of Women

By WALTER L. JOHNSON, Ph.D.

ALTHOUGH it is well known that large numbers of women are attracted to the health and medical care field, the numerical extent of their employment and the trends toward their greater participation are not always recognized. In 1940, about 58 percent of all workers in the health field were women; by 1950, this proportion had increased to 63 percent (1a), distributed by occupation as follows:

Occupation	Percent women
Professional worker.....	63
Service worker.....	66
Clerical worker.....	91
All other (residual).....	35

With the exception of the residual occupations, which constituted only about 9 percent of all workers in the health field, women predominated by a ratio of two or more to one.

A more detailed analysis of the professional group in the health field in 1950, including those in medical and other health services and in hospitals, reveals a similar pattern for specific professional occupations, except medicine and dentistry. The percentages of women in selected professions (1b, 2) are:

Profession	Percent women
Nurse, registered and student.....	98
Dietitian, nutritionist.....	97
Social worker.....	81
Medical technician.....	60
Physician .....	6
Dentist .....	3

If physicians and dentists are excluded, about 9 out of 10 professional workers are women, a ratio which might surprise even those most familiar with the characteristics of health personnel.

This paper proposes to defend and emphasize the proposition that these facts identify a whole area of study which is relevant and significant to better understanding and control of personnel shortages in the health field today. Such an emphasis is needed for the reason that insufficient attention has been given to exploring the effect of this kind of sex ratio on the personnel turnover problem—either from the standpoint of measuring its relative influence on the entire personnel problem or of formulating possible courses of action in which this sex ratio is taken into account.

Of course, in a general way, it is widely recognized that the presence of women in significant numbers in any industry or occupation usually increases the magnitude of certain kinds of personnel problems over what they would be if high ratios for men prevailed. However, the application of this hypothesis in the collection of data to measure its effects or in the formulation of broadly conceived programs which cater

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to the needs of women has lagged. This is an omission which might be profitably explored in view of the likelihood that shortages of health personnel are likely to remain critical.

In presenting this point of view, no cure for these problems is offered. They have complex and ramifying roots, and long-range solutions will undoubtedly be difficult to achieve. On the other hand, even partial clues which may suggest operations for relieving some of the pressures on personnel administrators now and in the near future may not be wholly unwelcome, and it is within this more restricted framework that the following data are presented. It is also recognized that the data are not new but it is hoped that by presenting them in a systematic and moderately comprehensive way, they may shed new light on an old problem.

The specific aims of this paper are (a) to analyze certain differences in working activities and in strength of attachments to the labor force between men and women, (b) to review certain characteristics of women which affect the probabilities that they will or will not participate in the labor force, and (c) to suggest possible steps for mitigating personnel problems in the health field. Such broadly based factual data are a necessary first step in placing this facet of the problem in its proper context and, in lieu of particular data from the health field, will provide clues as to the specific influence of the sex ratio on the size of the personnel problem. A quantitative review of the data may also help the administrator to decide whether or not the effect of the sex ratio is sufficiently great to indicate further pursuit of the problem.

### Sex Differences in Work Behavior

For many decades, the proportion of women in the labor force has risen continuously (3, 4). On the other hand, many differences in attitudes toward gainful work and in actual work behavior between men and women still prevail and will probably continue to prevail in the foreseeable future. An obvious example pertains to the important differences in classes of occupations and industries which attract women as compared with those which attract men (1b, 5). Another significant difference refers to the variations in stability and dura-

tion of employment. Both men and women move about a good deal within the labor force, that is, from job to job and from occupation to occupation (6-8), but their patterns of withdrawal from and reentry into the labor force itself are less similar. Women clearly differ from men in that they manifest a much larger volume of both withdrawal and reentry.

Monthly sample studies of the labor force, conducted by the Bureau of the Census, have presented two lines of evidence for measuring sex differences in participation in the labor force: (a) the work experience of the civilian noninstitutional population in the year preceding the January of enumeration insofar as these experiences could be constructed through retrospective methods and (b) monthly labor force turnover rates (9a, 9b).

First, with respect to annual work patterns, if the experience of any "normal" year is examined, that is, any year not marked by economic upheaval or war, it will be found that, (a) of all persons reporting any work experience for the year, a sizably larger proportion of women than of men will report part-time rather than full-time work during the year and (b) of those persons reporting any work, a sizably smaller proportion of women than of men will have reported working a full year (50-52 weeks). In 1954, for example, in the civilian noninstitutional population, over one-quarter of the women (27 percent) reporting work during the year worked at part-time jobs, whereas about one-tenth (11 percent) of the men employed worked at part-time jobs. Although among all women working during the year, over one-third (38 percent) reported that they worked for the full year, 66 percent or nearly two-thirds of the men stated that they had worked for the full year. These and other comparisons of annual work experience by age may be found in table 1.

Second, closely linked to these annual work patterns are the variations in labor force entry and withdrawal rates between men and women, and it is probable that differences in the volume of these movements largely account for the annual work experience patterns observed above. In any given year or month, a larger absolute number of women can be expected both to enter and to leave the labor

**Table 1. Work experience of the civilian noninstitutional population, by age and sex, United States, 1954**

Age	Total population, in thousands		Percent reporting any work, 1954		Percent workers reporting full-time work		Percent workers reporting working 50-52 weeks	
	Male	Female	Male	Female	Male	Female	Male	Female
Total .....	54, 124	59, 528	85. 6	42. 8	89. 4	73. 2	66	38
14-17 .....	4, 533	4, 453	49. 8	33. 9	30. 5	31. 5	3	2
18-19 .....	1, 805	2, 120	81. 3	62. 6	70. 8	76. 6	27	24
20-24 .....	3, 620	5, 344	87. 2	57. 1	89. 7	85. 8	45	40
25-34 .....	11, 068	12, 212	97. 8	44. 8	95. 7	78. 0	73	40
35-44 .....	10, 759	11, 486	98. 4	50. 3	95. 5	74. 1	76	40
45-54 .....	9, 097	9, 389	97. 6	49. 4	95. 2	75. 2	76	45
55-59 .....	3, 752	3, 932	93. 3	39. 7	93. 8	72. 8	71	45
60-64 .....	3, 179	3, 355	86. 3	34. 7	89. 9	70. 8	67	45
65-69 .....	2, 522	2, 695	66. 9	22. 0	82. 1	57. 9	56	37
70 and over .....	3, 790	4, 542	32. 0	8. 3	64. 8	54. 9	45	35

SOURCE: Reference 9b.

force (table 2). In 1952, in an average month, for every 100 men entering the labor force 169 women entered, and for every 100 men leaving the labor force 170 women left. If the youngest and oldest age groups are excluded, since they are less stable in their labor force attachments, the differences between men and women become much more pronounced. For instance, in the age group 25-44, which constitutes nearly half the total and may be considered to be the backbone of the labor force, for every 100 men entering the labor force in an average month, about 500 women will enter, and for every 100 men withdrawing in the same period, about 500 women can be expected to withdraw.

The size of the differences in both of these measures is great enough to identify distinct variations between men and women in average individual work patterns. On the whole, working women do not have the close and sustained relationship to the labor force that men have, though of course the internal variation of individual cases around each hypothetical average is probably large enough so that there is a great deal of overlap in work patterns.

#### Factors Affecting Working Patterns of Women

The reasons women differ from men in their degree of attachment to the labor force are not difficult to find, and they have been recognized since women began to assume some importance

in the labor force. Women respond to the demands of the feminine role first and to occupational roles second. Hence, to a greater extent than is true of men, external and nonoccupational factors are of primary importance in modifying the occupational behavior of women. This more general point will be considered later but, before doing so, an attempt will be made to measure the strength of some of the specific factors which are associated with low rates of labor force participation by women.

#### Marriage

Marriage is the first factor which tends to detach women from gainful activity in the labor market. While there has been a steady and progressive increase of married women in the labor force in recent years, marriage still brings about a larger volume of withdrawals of women, age by age, from what it would have been if the women had remained single (*Id*). Differences in labor force participation between single women and childless ever-married women are large in every age group, and it even appears that the differences increase with advancing age (see chart). Possibly 1 out of 3 or 4 women at work when they are single will cease to work when they marry or will withdraw from the labor force later.

There is added significance to these differences when it is seen that the proportion of all single women in the general population declines

**Table 2. Average monthly entries and withdrawals from the civilian labor force, by age and sex, United States, 1952**

(Numbers in thousands)

Age	Average civilian labor force		Average monthly additions to the civilian labor force			Average monthly withdrawals from the civilian labor force		
	Male	Female	Male	Female	Female to male ratio	Male	Female	Female to male ratio
Total .....	43, 454	19, 513	1, 188	2, 005	1. 69	1, 177	1, 996	1. 70
14-19 .....	2, 896	1, 996	560	397	. 71	480	359	. 75
20-24 .....	3, 338	2, 504	90	210	2. 33	136	217	1. 60
25-44 .....	20, 530	8, 758	151	804	5. 32	156	792	5. 08
45-64 .....	14, 276	5, 668	203	509	2. 51	210	528	2. 51
65 and over .....	2, 415	590	184	85	. 46	195	100	. 51

SOURCE: Reference 9a.

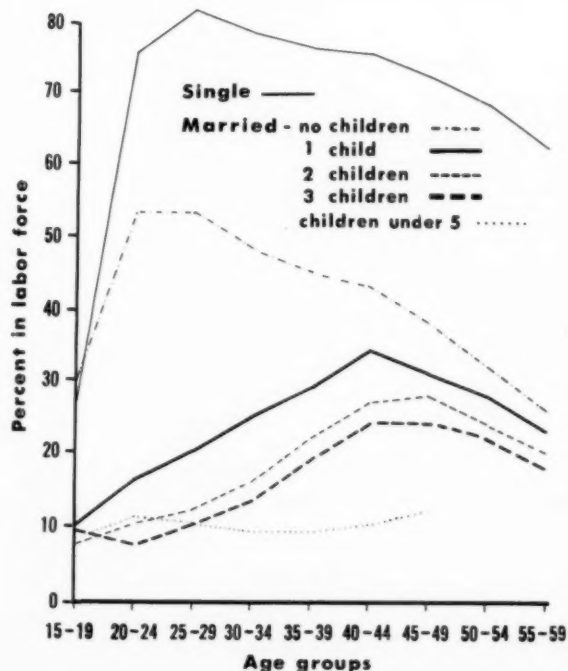
precipitously within a short space of about 7 or 8 years. It may be estimated from census data (1c) that of a cohort of young women of the same age, about one-quarter will have married by age 19; by age 21, one-half will have married; by age 24, three-quarters will have married; and by age 26, about 83 percent will have married. For the specific age groups from 18 through 22, it can be estimated that 9 to 13 percent within each age group will marry each year. In view of the preceding data, the probabilities are high that a sizable minority of those who do marry will quit the labor market or will not enter it. Assuming that one-quarter of those who marry do leave the labor market, this would give a rate of attrition of about 2 or 3 percent per year of all women in each of these age groups.

#### Children

The second factor associated with widespread withdrawals of women from the labor force, which is more significant than the fact of marriage alone, is the arrival of children (1d). The effects of these responsibilities are particularly noticeable during the children's early formative years when the needs for continuous care and guidance are greatest. It is at this point that the lowest rates of participation by married women in the labor force are observed. Not more than about 9 to 13 percent of the married white women in any group with children

under 5 years of age were classified as in the labor force in 1950 (see chart). In addition to the age of the children, the number of children that mothers have to care for has some effect on labor force participation. The chart also

**Percentage of white women in the labor force: single women; married women, by number of children ever born; and married women with children under 5 years of age, United States, 1950. (Source: Reference 1d.)**



shows that there is a small but consistent decrease in the proportion of married women in the labor force with increasing numbers of children ever born to them, and these differences hold for all age groups.

In all instances, the rates of participation in the labor force by women with children are lower than for married women without children. The differences are most marked in the younger age groups, and here they are even greater than the differences between married women without children and single women. On the other hand, there is a good rise in the rate among the married women with children (except for those with children under 6 years of age), with the advancing age of the mother. This suggests that many women tend to reenter the labor force as their children become old enough not to require the kind of care necessary in the preschool and early school years. It may be this kind of movement which is partly responsible for the large number of additions of women to the labor force observed above. In any event, it is obvious that both marriage and parenthood are potent forces operating on the female labor market and that they bulk large in explaining the constant personnel turnover among women.

Also highlighted by these data is the quantitative importance of noneconomic and nonoccupational factors in the determination of when and how long women will be employed in the labor force.

### **Practical Implications**

Differences in working patterns between men and women and the underlying attitudes and values which determine them are relevant facts to an industry such as the health field, which is heavily dependent on women for the delivery of services and the performance of necessary functions. Greater personnel problems can be expected, primarily for the reason that maintenance of the size of personnel is, potentially at least, a greater problem among women than among men. The working patterns of women and their possible role in contributing to the problems of personnel through attrition in this field should be given some consideration unless specifically disproved as not applicable to this

industry or to particular occupations within it. To give such recognition may help to identify areas where inordinate amounts of resources and energies are being applied to only small segments of the total personnel problem. An example might be the case of an agency becoming concerned with working conditions and job satisfactions to the virtual exclusion of other considerations, on the assumption that these internal factors are exclusively related to holding employees to their jobs. It is clear that intrinsically, these are legitimate and significant organizational goals but if they are linked solely to solving personnel problems, it is not evident that they will be wholly successful. Particular agencies probably gain certain competitive advantages through such programs, thereby enabling them to attract personnel from other agencies. This, however, is analogous to robbing Peter to pay Paul, and the net effect toward the solution of the larger problem is zero.

Within broad limits, data of this sort suggest the systematic exploration of programs of action which aim more directly at utilizing to a greater extent some of the lost womanpower which attends the marginal status of women in the labor market. For example, greater flexibility in planning workloads and in making allowances for part-time work could be instituted in many instances. When compatible with organizational goals, conscious and deliberate attention to the needs of women, considered within their framework of reference and the competing demands on them, could conceivably be implemented to induce some women to maintain their attachments to the field or to return to it. Even a small measure of success along these lines would ease or mitigate a situation which is critical at the present time.

Another overlapping possibility suggested by this analysis is to take advantage of an ongoing trend, namely, the increase of married women with older children in the labor force, and to give greater consideration to recruitment from these ranks. It is perhaps unrealistic to assume that women of this age category could or should be persuaded to train for some occupation with formal requirements. On the other hand, within the field at the present time, there are certain on-the-job training experiences for some categories of personnel, and undoubtedly there

are many positions into which this age group could be fitted successfully. Moreover, there are many women, now inactive, who have been trained in skills in the health field. Nurses are an excellent example of such a group. It has been estimated that in 1951 the following proportions of nurses were active:

<i>Age</i>	<i>Percent active</i>
Under 30-----	53
30-39-----	39
40-49-----	35
50-59-----	33
60 and over-----	19

For all ages, about 45 percent of the nurses were estimated to be active (10). Until shown to be otherwise, it might be assumed that, given the appropriate conditions, many of these nurses could be induced to return to work in the health field. The same principle may also be applicable to other professional personnel.

Finally, one long-range solution which is suggested is the recruitment of men for ancillary positions in this field. The complexities of this approach are obvious, and in the short run chances of success are probably not great. This should not be allowed to obscure the possibility of change in the long run, however. It would seem that exploratory research and experiment in this area are indicated.

### Summary

With the exception of physicians and dentists, the important professions and occupations in the health and medical care field are numerically dominated by women. This fact alone can be used to account for many of the personnel shortages in this field, when it is explicitly recognized that over a period of time the working patterns of women do not show the stability and continuity that are generally true for men. Because of marriage and childrearing, coupled with distinctive feminine attitudes toward work, large numbers of women tend to withdraw early from the labor force. This has the effect of creating many job vacancies where none would exist if the jobs were held by men and complicates the problem of personnel short-

ages already aggravated by general expansion in activity.

Certain practical steps may be taken to improve this situation. For example, greater attention to the needs and motivations of women and consideration of recruitment from the middle-aged group of women and from men are suggested.

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# clean air

Samples of four papers presented at the 49th annual meeting of the Air Pollution Control Association, May 20-24, 1956, Buffalo, are the following condensations of papers by Dr. F. W. Bowditch, Dr. August T. Rossano, Dr. Charles R. Williams, and Benjamin Linsky, president of the association.

Organized in 1907, the Air Pollution Control Association is the only national association devoted solely to air pollution control. Its membership represents widely diversified interests of industry, science, education, government, and the public.

Technical committees of the organization develop standards and reports and initiate research for industry. APCA publications keep members informed of new equipment, surveys, and research.

The *Journal of the Air Pollution Control Association* is published four times a year. Abstracts of current literature are published monthly. The yearly proceedings contain all the papers presented at the annual meeting.

Copies of individual technical papers can be obtained from Harry C. Ballman, executive secretary, Air Pollution Control Association, 4400 Fifth Avenue, Pittsburgh 13, Pa.

## The Louisville Study



To meet the need for rubber products in World War II, the Federal Government embarked on an intensive program of synthetic rubber production. A large plant for production of chemical rubber was built in an industrially zoned area on the southwest side of Louisville, Ky. Within a short time a dense network of plants producing rubber or its components sprang up. The area appropriately became known as Rubbertown, and shortly thereafter residents of the West End, an adjacent residential area, began complaining of odors, dust, and eye irritation.

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*By August T. Rossano, Jr., Sc.D., director of field studies, Community Air Pollution Program, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati.*

This air pollution was generally attributed to operations in Rubbertown. Citizens' attempts at court action were unsuccessful.

### History of Air Pollution Control

Louisville established a smoke commission which later became the Louisville Air Pollution Control Commission. After passage of a State enabling act, air pollution control became countywide with creation of the Jefferson County Air Pollution Control District in 1952.

Studies by the University of Louisville and the Battelle Memorial Institute attempted to determine the nature and source of air pollution in the West End. Their findings shed some light on the problem, but the results were not sufficiently conclusive to effect the desired abatement.

In July 1955, within a few days after Public Law 159 authorized the Public Health Service to establish a research and technical assistance

program in air pollution, the Jefferson County Air Pollution Control District requested the Service to assist with a study of pollution in the West End. The interested agencies agreed to the Service's proposal for a joint Federal, State, and local study.

The study was formally initiated in January 1956. The schedule calls for 6 months of preparation for full-scale operation, 1 year of detailed study and observation, and 3 to 6 months to evaluate and report findings. The broad objectives are to augment existing knowledge of the nature, extent, and sources of the problem as a basis for rational control.

### **Memorandum of Agreement**

The memorandum of agreement sets forth the conditions of the study. The Air Pollution Control District of Jefferson County, the Louisville and Jefferson County Board of Health, the Kentucky Department of Health, and the Community Air Pollution Program of the Public Health Service are the cooperating agencies.

A steering committee, consisting of a representative from each agency, assists the technical director in nontechnical matters. The director serves as executive secretary of the committee and presents monthly progress reports to it. The release of nontechnical information is by unanimous approval of the committee. Final reports will be issued jointly by the cooperating agencies.

The budget is approximately \$175,000 a year. The local contribution is largely in funds with which to procure additional personnel, equipment, supplies, and services. Industry has subscribed approximately half of the local funds. The Federal contribution is in technical services and equipment. Local and Federal contributions are approximately equal.

### **Preliminary Operations**

Personnel were recruited through personal communication and advertisements in technical journals and local newspapers. Employment of the non-Federal staff is by contract between the individual and the county control district. Responsibility for recruitment and selection rests with the technical director.

His staff consists of an engineer in charge, who is responsible for administrative, statistical, engineering, chemical, and meteorological services, and 13 full-time employees, who include personnel from the local board of health, Air Pollution Control Board, and the United States Weather Bureau. In addition, private and governmental consultants participate in the study. The chemical laboratories are provided by the State health department.

### **Plan of Study**

The first objective of the study is determination of the quality of the air in and around the West End by analyses for various particulate and gaseous pollutants and for variations and fluctuations in their concentrations. Time and space considerations include diurnal, seasonal, and long-range trends and patterns and comparisons of pollutant concentrations on the basis of their horizontal and vertical distribution.

The second major objective is a study of the relation to air quality of meteorological and micrometeorological factors.

In approaching these two objectives four basic principles were adopted as guides to air sampling and meteorological observations. They are:

A comprehensive network of fixed observation stations covering the area of interest.

Measurements on a simultaneous and continuous basis 24 hours every day including weekends and holidays.

Sampling periods as short as practicable to obtain data suitable for estimating diurnal patterns.

Thorough analysis of selected samples.

### **Air Sampling**

The air sampling network (see chart) is laid out on concentric arcs 2 and 3½ miles from Rubbertown. Most of the stations are between 10° and 50° azimuth to provide greater coverage for the West End area and take into account the prevailing wind direction from Rubbertown. Placing stations equally distant from the source eliminates the distance factor as a variable in comparisons of station results.

Stations 1 and 3 are the upwind and downwind stations  $3\frac{1}{2}$  miles from Rubbertown.

Station 5 is on a line between Rubbertown and station 1 and collects data to indicate the influence of distance from the source.

Stations 4 and 6, flanking station 5, increase the chances of collecting polluted air originating in Rubbertown and provide information on the concentration gradient across the polluted air stream under prevailing wind conditions.

Station 2, also on the  $3\frac{1}{2}$ -mile arc, collects typical samples of urban air not directly influenced by Rubbertown pollution under normal conditions.

In addition to at least one fully equipped mobile station, built into a small truck, will supplement the fixed stations.

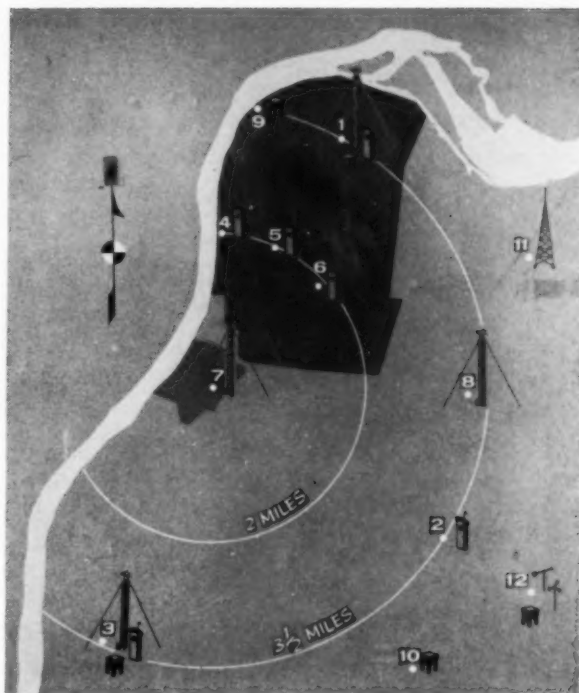
Two conventional high-volume samplers, using glass-fiber or cellulose filter paper, operate alternately at each site on an 8-hour cycle and collect 3 samples daily from each. An automatic timer controls the operation at night.

One innovation is a specially designed standard shelter. Another is having the principal axis of the high-volume sampler on a vertical rather than horizontal plane, thus minimizing any preferential effects.

Modified filter-tape samplers permit analysis of particulate matter by flame photometry. Dustfall containers and adhesive surfaces are likewise provided. Collected material is subjected to special morphological examination.

The analysis of particulates collected by the high-volume samplers consists of determination of total loading and organic and inorganic fractions. Chlorides, sulfates, and nitrates are determined by wet chemical methods. Finally, an analysis for 19 cations is made by emission spectroscopy and flame photometry.

Nonspecific gas sampling on an intermittent basis includes evacuated glass, plastic, and stainless steel containers, and freeze-out traps that use liquid oxygen or nitrogen. Collected samples are analyzed in the mass spectrometer at the National Bureau of Standards. Specific gases are sampled by conventional scrubbers, absorbers, impingers, and evacuated flasks. Continuous gas sampling is presently confined to an  $\text{SO}_2$  recorder, to be supplemented later by other  $\text{SO}_2$  units and other automatic sampler-analyzer equipment. Under development are



**Air sampling and meteorological stations, Louisville, Ky.**

continuous gas-sampling techniques utilizing compression cylinders, resin and activated carbon adsorption, and gas chromatography.

#### **Meteorological Network**

Considerable effort is being devoted to operation of a comprehensive meteorological network, planned, serviced, and analyzed by Weather Bureau personnel assigned to the Sanitary Engineering Center of the Public Health Service and to Louisville. Two of the four main meteorological stations coincide with stations 1 and 3 of the sampling network.

The equipment at each station consists of a 61-foot aluminum and steel tower supporting a wind vane and anemometer wired at the tower base to continuous recorders. Each station has a recording hygrothermograph and wet-bulb and dry-bulb thermometers housed in standard shelters. Other hygrothermograph recorders are situated high on the south side and in the extreme northwest of the city.

Meteorological instruments installed on a television tower include a wind vane at 525 feet, thermohms at 50, 170, and 524 feet, and continuous recorders at the base. Tower instru-

mentation will permit vertical soundings of the atmosphere for measuring its stability. Wire-sonde observations are made periodically with mobile meteorological equipment.

#### Source Inventory and Other Studies

The third phase is an inventory of air pollution sources in Rubbertown to learn the nature and rate of industrial discharges and develop a basis for regulatory measures. Preliminary studies are made of plant processes, materials, mechanical equipment, waste products, and points of emission. Detailed stack sampling operations are being carried out with the assistance of the Bureau of Mines and the Public Health Service to determine the amount and chemical composition of solid and gaseous wastes. In addition, size, shape, and surface area of emitted aerosols are determined. Tracer studies will determine the range and influence of selected point sources.

Another major phase is a survey of the nature and origin of objectionable odors in the West End. The procedure includes study of industrial operations and collection and cataloging of samples of odorous material. Staff personnel use odor reference kits during routine surveys and intense fumigations. The Sanitary Engineering Center is developing an olfactometer for quantification of odors.

A pilot study in the West End will determine the nature, extent, and relative frequency of intense local fumigations resulting in objectionable odors, excessive dust, or related discomforts. This undertaking depends largely on the cooperation of trained volunteer observers, who report monthly on their daily records of odor, dust, or irritating pollution incidents. This activity provides both a means for determining the type, location, and frequency of annoying fumigations and a way of alerting emergency crews to peak levels of pollution.

Early in the planning, a working relationship was established with the analytical statistics group of the Sanitary Engineering Center to handle the voluminous data anticipated. In addition to consultation in the design of the survey, the center assists project analysts in the reduction, analysis, and interpretation of data.

This air pollution investigation gives full cognizance to the importance of adequate public information. The public is given a clear understanding of the scope and general approach of the study, the participating organizations and staff, and the amount and variety of technical work required and is apprised of developments by successive news releases. The ultimate aim is favorable public opinion so that the findings and conclusions will be of maximum use.

## Automotive Vehicle Fumes



The automotive exhaust problem receiving the greatest attention since the tetraethyl lead scare of the 1920's relates to the areawide smog effects recognized frequently in Los Angeles and far less frequently in other metropolitan areas. The vegetation damage, rubber cracking, eye irritation, and visibility interference noted in Los Angeles are now generally attributed to invisible hydrocarbons and oxides of nitrogen in large part from automotive exhausts.

But the greatest private attention given air pollution from automotive exhausts relates to the localized effects that are recognized daily everywhere in the civilized world. The effects are annoyance to the senses because of odor, visibility interference from the plume, sky darkening by the plume, soiling of surfaces, and toxic effects of some of the gases in confined spaces and high traffic concentrations.

Automotive exhausts include, in addition to the invisible hydrocarbons and oxides of nitrogen, a variety of gases and solid and liquid particles such as invisible carbon monoxide, invisible aldehydes, other invisible nitrogen compounds, visible carbon, visible hydrocarbons, and other complex petrochemicals, invisible water vapor, visible water droplets, and metallic compounds.

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*By Benjamin Linsky, M.S.E., P.E., at the time of the conference, chief smoke inspector, Detroit Bureau of Smoke Inspection and Abatement, and now, control officer, San Francisco Bay Area Air Pollution Control District.*

No community willingly accepts excessive visible automotive exhausts, undoubtedly because the point of exhaust is always less than 15 feet above the road. Usually, these objections are established in local or State traffic laws.

### **The Detroit Program**

Detroit renewed its air pollution control program in 1947 with a new ordinance, new budget, and new staff. So comprehensive was the ordinance in its coverage that as early as 1948 violation notices were being written against smoky diesel trucks by air pollution inspectors using Ringelmann and Umbrascopes scales.

The undesirable effects were primarily localized rather than areawide, in the categories of sky darkening, horizontal visibility interference, soiling of surfaces, and annoyance to human senses. The administrative methods used were politely worded violation notices, hearings on maintenance practices of truckers and bus operators to improve internal reporting and correction, and court enforcement.

Though these procedures were effective, difficulties were encountered. The air pollution inspectors, driving civilian cars, in civilian clothes, found it dangerous to stop smoky vehicles on expressways. The ordinance inadequately covered the heavy blue-white emissions from oil-burning jalopies and poorly fueled 2-cycle diesel engines. The automotive smoke problem became more apparent as other smoke problems were reduced.

### **Industry-City Effort**

The Smoke Abatement Bureau of Detroit explored better ways of control. It was decided by the several departments involved that the motor vehicle code should be the basis for effective legal control and that the police would do the job of surveillance, patrolling, and field enforcement with assistance from the bureau.

Accordingly, an ordinance amending the code was drafted, cleared with the city, and introduced by the common council. It was read twice, ordered published, and laid on the table. Then things began to happen.

Engine makers, fleet operators, and bus and

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### **Urban Effects**

Linsky has classified eight undesirable community effects, areawide or localized, of air pollutants on level terrain, according to the following categories:

- Sky darkening.
  - Horizontal visibility interference.
  - Soiling of surfaces.
  - Vegetation damage.
  - Other property damage.
  - Interference with production or services.
  - Annoyance to human senses.
  - Direct damage to health.
- 

truck makers and their organizations met with each other and with the smoke abatement bureau, police department, and corporation counsel. Truck fleet operators and engine salesmen explained to each other how excessive smoke could be avoided. The Automobile Manufacturers Association offered to work with the smoke abatement bureau to develop the best possible program in the hometown of the automobile industry.

The AMA's offer was accepted with a time limit for accomplishment. On its expiration a second time limit was set. Before it expired, the first portion of the project had been adopted by the council. How was this accomplished?

### **Steps Toward Agreement**

First, the automotive industry, truckers, bus fleet operators, and city representatives talked out the problem. Together they observed cars, buses, and trucks at selected intersections. This established a uniform viewpoint and "equalized the ignorance." At this point the dramatic difference in the effects when different grades of diesel fuel oil were used in identical 2-cycle engine diesel buses belonging to different fleet operators was fully recognized.

The smoke abatement bureau assigned a supervising engineer to work with the AMA committee. Periodic meetings of the committee were held with legal advisers and the author to assure parallel viewpoints.

Meanwhile, a national bus company switched to use of a higher priced grade of diesel oil.

The municipally owned system had done this several years earlier.

The first result was the AMA production of a training film to show the difference between necessary and unnecessary visible emissions.

The ordinance was rewritten by the engineers and legal specialists of the AMA and the city.

The film and its narrative were reviewed by the police department and the industry-city team. The rephrased ordinance was then discussed and agreed upon with one modification that grew out of the practical experience of the police traffic administrator.

The industry-city team then presented the film and the final ordinance to the common council. The council was told that a color-printed pocket guide on visible emissions was in preparation and that its use might justify a change in the ordinance within a year.

The ordinance became effective in April 1956 with the support of trucking, cartage, and automobile club representatives.

The industry-city team showed the film to 300 police traffic safety officers and discussed the ordinance.

The deputy superintendent of police instructed police to give warnings for 60 days and then issue violation tickets.

The police commissioner directed the police department to keep a running count of "smoking vehicle" violations.

Arrangements were made for the industry-city team to present the film and discuss the ordinance with traffic court judges and referees.

### The Revised Ordinance

In the original ordinance, the responsibility for smoke violations was placed solely on the operator and did not cover the unattended vehicle with its engine running and smoking. It read:

"No motor vehicle operator shall run his motor with cutout open or make any other unnecessary sound disturbance or operate a vehicle emitting from any source an unreasonable quantity of smoke, noxious gases, or vapor."

In the new ordinance, the owner, lessor, and driver are responsible because real responsibility does not always rest with the driver. Prob-

ably he should be solely responsible only when his "heavy foot" or "lazy gear shift hand" allows a diesel engine to lug at low engine speed. The new ordinance covers moving or stationary vehicles and adds the words "excessive," "unnecessary," and "obnoxious" to "unreasonable" in the original. It reads:

"No person, firm, or corporation shall operate or cause to be operated upon any street, highway, or other public place a motor vehicle, while stationary or moving, which emits from any source any unreasonable, excessive, or unnecessary smoke, obnoxious or noxious gases, or vapor."

"Unnecessary" was inserted to cover the heavy foot of the jackrabbit driver of a diesel vehicle, the use of a grade of diesel oil other than that specified by the engine maker, worn piston rings on a gasoline engine, and similar conditions.

"Excessive" was inserted primarily to cover the situation where a diesel engine is too low powered to handle the load with the gearset provided, with a resulting low engine speed, high torque, and shortage of combustion air.

"Obnoxious" was added to acknowledge that the odor of exhaust gases may be controlled through proper equipment design. Engineering advances make this practical, especially for 2-cycle diesel engines and the larger gasoline engines.

## Automotive Industry Effort



Industry research by automotive manufacturers over the past years has helped reduce smoke emission from new motor vehicles. In recent years their interest has been formalized in the establishment of the Vehicle Combustion Products Subcommittee of the Automobile Manufacturers Association. This group has engaged in extensive cooperative research on exhaust emissions.

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*By F. W. Bowditch, Ph.D., chairman of the Special Group on Exhaust Smoke of the Automobile Manufacturers Association and senior research engineer at the General Motors Technical Center, Detroit.*

When Detroit sought some means of dealing with vehicles emitting unnecessary amounts of smoke, the AMA offered technical, legal, and engineering assistance. The association proposed a joint research program with the Detroit Smoke Abatement Bureau as a basis for planning satisfactory enforcement.

The subcommittee assigned the technical aspects of the study to a Special Group on Exhaust Smoke, composed of engineering representatives of the major automobile, truck, and engine manufacturers.

Unnecessary visible emissions from gasoline-powered vehicles are usually caused by excessive oil consumption resulting from worn piston rings, cylinder liners, and valve guides. Similar emissions from diesel engines generally result from overfueling that may be caused by incorrect injector adjustment or burned injector tips, restrictions in the inlet air system, substandard fuel, overloading, cold operation, or mechanical deterioration of the engine.

It was readily established that specific legal definitions, such as the length or duration of the emission, have been unsatisfactory in apprehending excessive "smokers." All vehicles do not have the same exhaust problems. Observations of exhaust lengths and duration depend on numerous factors.

Discussions with smoke abatement and police officials, supplemented by street observations, indicated the need to train enforcing officers in recognizing unsatisfactory smoke conditions.

As a first step, the special group produced a training film. Each participating company took color motion pictures of emissions from different types of vehicles against various backgrounds. Because of the difficulty in obtaining shots on city streets, running vehicles on company proving grounds simulated actual smoking conditions. Films best approaching typical conditions were combined in a preliminary film. The final professional version was based on the favorable response of city and industry officials to the preliminary film.

The next step is the development of portable guide materials for enforcement officers. Members of the special group are taking color still shots, which will be thoroughly reviewed with city representatives and user groups. A concurrent study is seeking means to reproduce the

pictures in realistic permanent form. The final result will be a kit of simplified charts for identifying grades of smoke emission from automobile exhaust.

Industry lawyers have worked closely with the smoke abatement bureau and the city corporation counsel in rephrasing sections of the ordinance that will complement the training materials. Concentrated, cooperative effort should accomplish the desired result with a minimum of inconvenience to the driving public.

## Fluoride Air Pollution



Because sufficient concentrations of fluorides in the atmosphere may damage living matter, it is inevitable that some parts of the United States are concerned about preventing losses of fluorides in manufacturing processes. Industries processing rock phosphate, fluorspar, and other ores of fluorine compounds are the main producers. Industrial consumers contribute their share to air pollution by fluorides.

It is relatively simple to identify an industrial source of fluorides when there is a single producer in the locality, because of the readily detectable biological effects in the neighborhood. The nature of the environment in which the producer is located will determine, to a large degree, the extent of pollution.

Air pollution by fluorides does not mean that these pollutants are not controllable nor that economic loss is not preventable. Economic loss results only if there is sufficient contaminant to do damage and if there is anything to be damaged.

Increased production of fluorides by industries has accompanied increases in production of fluoride byproducts. Further, when such industries move into areas with little experience in control of air pollution, the degree of con-

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*By Charles R. Williams, Ph.D., associate professor of applied industrial hygiene, Harvard School of Public Health, and director, industrial hygiene services, Liberty Mutual Insurance Co., Boston.*

tamination tends to run ahead of control measures.

### Phosphate Rock

Phosphate rock is used primarily for production of superphosphates (fertilizers), food and medicinal phosphates, elemental phosphorus, phosphoric acid, ferrophosphorus, and stock and poultry feed. It is also applied directly to the soil as fertilizer.

In Florida and the four western States of Idaho, Montana, Utah, and Wyoming, production has more than doubled since the war. In Tennessee, it has remained relatively stable. United States production increased from 5,399,739 long tons in 1945 to 12,031,213 in 1952.

In general, superphosphates are processed near the source of the ore, but availability and cost of power influences the location for manufacture of elemental phosphorus. Since Florida lacks sufficient power for phosphorus production, it uses most of its rock phosphate for fertilizer. Tennessee and the western States predominate in phosphorus production because of abundant power.

Rock phosphate, if it is high-grade ore, contains 2 to 3 percent fluorine. Fluorine is present in a fixed ratio to phosphorus, roughly 25 tons F in every 1,000 tons of rock processed. Wherever the rock is so processed that fluorophosphate is broken down, large quantities of fluorides can be released.

For every ton of rock processed, 40 to 60 lb. F may be released. A plant processing 1,000 tons a day can produce serious pollution if uncontrolled.

In the production of elemental phosphorus, the fluoride may be released in several processing steps. Because of the complexity of the operation, fluoride balance studies are needed to determine where losses in production actually occur. From an economic standpoint, it is wise to apply control measures only where they are really needed.

Some fluoride loss occurs in calcining or sintering the ore, depending on the temperatures used. Significant loss may occur in the electric furnaces, as fluorides escape into plant air and to the outdoor atmosphere. Other loss is in the off-gas, which in burning releases flu-

oride to the atmosphere. Substantial amounts of fluoride may be trapped in furnace slag and released as the slag cools.

In the production of superphosphate, the rock is treated with sulfuric acid with a resulting release of hydrogen fluoride and silicon tetrafluoride. The nature of the operation calls for its location in agricultural areas. Large tonnages of ore are handled, and, thus, large quantities of gaseous fluoride are released.

In the production of concentrated superphosphate, a new development in fertilizer manufacture, the release of fluorides is even greater. In some areas, damage has progressed from borderline to definite. This fertilizer is made by producing phosphoric acid from phosphate rock and treating additional rock with the acid.

Control efforts in each of two small areas, one in Florida and one in Tennessee, have been complicated by fluoride emissions from 10 to 12 plants producing superphosphate, phosphoric acid, animal and poultry feeds, and elemental phosphorus. With so many plants and their wide variations in manufacture, it is almost impossible to assess the blame for damage. Since the ultimate criterion is the total amount of fluoride emitted in an area, the permissible effluent from each plant must be reduced substantially.

### Major Industrial Users

Fluorides used in the production of steel and aluminum are another large-scale source of pollution.

Though it is difficult to assess the proportions of fluorides released to the air, the steel industry is a major user of fluorspar, primarily as a flux in the manufacture of basic open hearth and basic electric steel. The industry used 53 percent of the fluorspar and 34 percent of the hydrofluoric acid consumed in 1952.

In the production of aluminum metal, the refined ore (alumina) is mixed with fluorides in electrolytic furnaces. The fluorides act as a flux and are released to the atmosphere as a result of decomposition under high temperature. They are carried upward by convection and, in the absence of local exhaust, are generally released through roof louvers. The amount escaping depends on the number and

size of the furnaces, on the operating procedures, and on the attempts to control the effluent.

One major approach is the installation of sprays and roof monitors to trap fluorides, but this solution has been unsatisfactory.

A second method is to provide local exhaust ventilation on each furnace and to remove the fluorides by passing the exhausted air through scrubbing towers. The effectiveness of recovery depends primarily on the kind of hood, the volume of air, and the type of scrubber.

Scrubbing systems are costly because of the large volume of air exhausted from large numbers of furnaces. In some plants,  $2\frac{1}{2}$  to 3 million cubic feet of air a minute are exhausted and scrubbed.

Aluminum production depends primarily on availability of ore and cost of power. The plants of six producers are located in Arkansas, Alabama, Louisiana, Montana, North Carolina, New York, Oregon, Texas, and Washington.

To judge by damage claims resulting from injury to cattle and vegetation in the Pacific northwest, it is obvious that aluminum reduction plants cannot operate without controlling the fluoride effluent.

#### **Evaluating Pollution Levels**

It is almost impossible to set permissible levels for the amount of fluoride effluent. The severity of the problem depends on the amount of emission and its distribution. Distribution is affected by climate, wind direction, and terrain. Time is a factor because gaseous fluo-

rides may be retained and built up in vegetation.

Continuous sampling of vegetation is the most satisfactory way of evaluating fluoride pollution of the air. A grid system and periodic samples of different kinds of vegetation collected during the growing season best measure the effectiveness of control.

There are few valid criteria for fluorides in vegetation because of two complex factors. One relates to the amount of fluoride that will cause plant damage; the other to the amount that will produce injury in animals which consume the vegetation.

The levels that will damage vegetation vary with species over an extreme range. Fruit trees and some types of flowers are particularly susceptible to injury at low concentrations. Levels in grasses and animal feed that will injure cattle also vary with the condition of the cattle, fluoride intake from water and other sources, and time of exposure.

Extensive fluoride damage has cost industry millions of dollars. In many instances, the cost of claims has been staggering.

To avoid further economic loss, the dissemination of fluorides must be substantially reduced. Ventilation and collection should be installed when a plant is constructed. Vegetation levels should be kept below 30 p.p.m. to prevent damage to cattle.

With the extensive data available, it is obvious that no plant emitting large amounts of fluoride can afford to neglect the engineering necessary to atmospheric safety. The possibility that fluoride recovery may prove profitable, also, is only an added incentive.

### **Fluoridation Progress**

Communities with a combined population of 6 million started fluoridating their water supplies in the first 9 months of 1956. The average annual increase for the past 5 years has been 4 million.

The latest tabulation by the Public Health Service shows that fluoridated drinking water is now supplied to one-fourth of the people using public water supplies. About 1,400 cities and towns with a population of over 30 million people were using fluoridated water at the end of September.

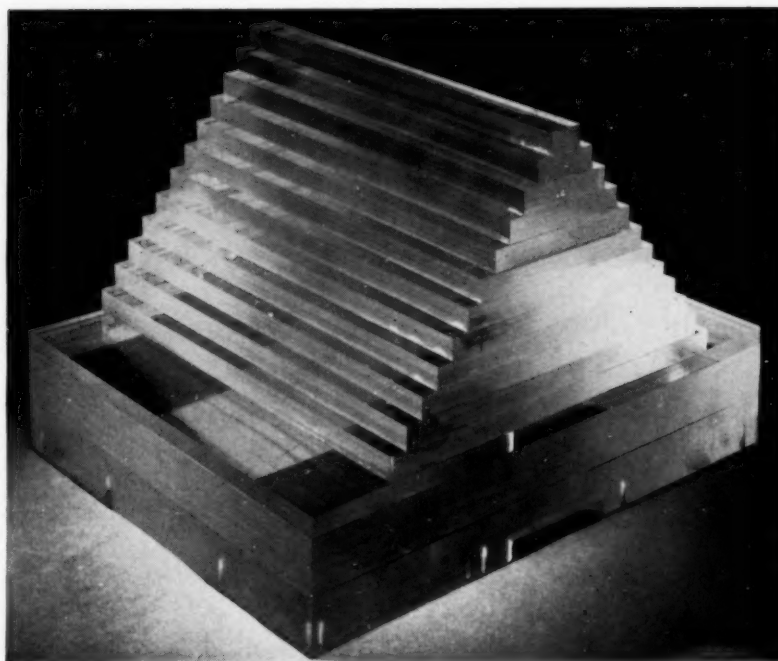
## Device for Standardizing X-ray Techniques

A large plastic stepped wedge, which facilitates the coordination of research facilities, roentgen film, equipment and technical procedures, providing a high degree of uniformity in results, is being used by the Medical Investigations Branch, National Institute of Dental Research, Public Health Service. This is part of a broad-spectrum research program which embodies extensive roentgen procedures in keeping with the need for long-range human population group studies, correlating systemic conditions with dental problems.

A salient aspect of these studies is the repeated roentgenographic evaluation of individuals and population groups over a span of years. To assure uniform and valid results, roentgen procedures have been standardized as much as possible within the realm of practicability. This has been achieved to a fair degree with the help of Robert Morrison, medical division, and Dr. Herman E. Seeman, research laboratories of the Eastman Kodak Company, Rochester, N. Y.

Dr. Seeman, long interested in this type of problem, developed the plastic stepped wedge which meets the unique requirements of the study series.

The dimensions of the wedge are such that its thinner sections require the same exposure as thin patients and the thicker portions correspond similarly to heavy patients. In use, it is radiographed several times with a variety of techniques representative of those used for the normal range in patient size. The radiographs and data are filed for later reference. At some prescribed time, say a year later, the wedge is again radiographed, using the same nominal techniques. If the radiographs match those made the year before, it may be concluded that no significant change has occurred



in the equipment or materials used. If the radiographs do not match, the techniques or processing are modified until a match is obtained or film interpretations are made on the basis of the variation. In this manner, it is possible to maintain a given diagnostic film quality even with a variety of changes.

This must not be considered the final answer to highly technical or scientific activities requiring carefully standardized techniques but constitutes a tool, particularly adaptable to field use, that affords a large degree of uniformity in procedure and results. It is obvious that the stepped wedge should be composed of a substance similar to bone and soft tissue in terms of radiographic qualities. However, the more it approaches the realistic, the more complicated is its application to the problem. It is better to have a simple, practical procedure with some assurance that it will be applied than a

more refined one which will be neglected because of the need for interpreting exact measurements.

The device permits a practical degree of standardization for studies, film, developer, equipment, or technique changes. It serves to check on radiographic quality, demonstrating gradual deviation that might accrue through virtue of technique, processing, or photographic deterioration. More finite comparisons are permitted through the use of a densitometer, plotting a series of curves in relation to the respective circumstances.

An epidemiological roentgen study in itself is unique, and the standardized X-ray techniques, utilized to facilitate the studies, constitute an unusual approach to clinical research. The device itself is a practical approach to a number of common problems routinely encountered in radiographic installations where volume warrants its use.

# Durability Tests Of Stainless Steel Hospital Utensils

By ARNOLD H. DODGE, B.S.

**T**HE CIVILIAN HEALTH Requirements Program of the Public Health Service is seeking to determine whether hospital items made from non-nickel chrome steel (known usually as type 430 or type 17, containing about 17 percent chromium) are as durable as items made of the conventional chrome nickel stainless steel. Should the lack of nickel sufficiently impair the wearability of such items, it would be poor economy to deprive these items of that metal. The amount of nickel used in the hospital items is trivial when compared with total consumption. On the other hand, there is no point in continuing to use a strategic metal if such use is demonstrably extravagant and unnecessary. To determine whether or not nickel should be allocated to hospital items under a nickel control plan, it seemed desirable to obtain durability test information.

Stainless steel is essentially an alloy of iron and chromium. Nickel and other elements are often added to improve workability and to add corrosion resistance that will withstand special or unusually severe conditions.

For more than 20 years, certain articles of operating room furniture and hospital utensils in common use have been fabricated from a chrome nickel stainless steel, known usually as type 302 or 18-8 and containing about 18 percent chromium and 8 percent nickel. There has been a chronic countrywide shortage of nickel for most of this period. During World War II and the Korean emergency, supplies of nickel fell far short of demand, and controls were established to cover essential mili-

tary needs. Nickel has recently become more important to the national defense because of the wide application of this metal in the field of atomic energy and specialized military activities. Logically, it is mandatory that the use of nickel be restricted to essential commodities during periods of war. Whenever possible, however, nickel-free alternates to the products affected by conservation orders should still be useful for economic reasons.

## Hospital Utensils

In February 1952, during the emergency in Korea, a meeting of an industry advisory committee of utensil manufacturers was held at the request of the National Production Authority (now the Business and Defense Services Administration). The agenda included, among other things, industry requests for assurance of a continued supply of chrome nickel stainless steel for the manufacture of hospital utensils and a discussion of the necessity for chrome nickel stainless steel in this class of items. If type 430 stainless steel is used exclusively, an estimated 10,000 pounds of nickel could be diverted annually to other purposes. Since no accurate or detailed information was known to be available about the durability of non-nickel stainless steel utensils, it was agreed to study selected utensils in use. The control authorities agreed that while the study proceeded manufacturers would continue to receive allocations of nickel-bearing stainless steel. Industry representatives offered to provide nickel-free utensils for the study. The Public Health Service agreed to oversee and arrange for tests in a hospital of six of each of the following utensils: bedpans, urinals, kickbuckets, and catheter trays with covers. Three of each were type 430 and three of each were type 302.

Through the cooperation of the American Hospital Association, arrangements were made to place the utensils in regular service at the Wesley Memorial Hospital in Chicago in September 1952. Basic instructions called for all test items to be kept in continual routine service and to be treated in the usual manner. Only supervisory personnel were aware of the test.

After 1 year of use, the utensils were forwarded to the office of Civilian Health Re-

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*Mr. Dodge is a senior pharmacist assigned to the Civilian Health Requirements Program, Office of the Surgeon General, Public Health Service. His paper is an interim report on a long-term study.*

# Hospital Utensils

## FIRST YEAR INSPECTION RESULTS

Item	Type 302 (8 percent nickel)	Type 430 (no nickel)
Bedpans	Few scattered pits on inside bottom; slight discoloration; some corrosion and rust at weld line.	Many small scattered pits on inside; rust and pits at weld line; some discoloration.
Kickbuckets	Some discoloration; few light rust spots and pits on inside.	Moderate discoloration; rust spots and few deep pits on inside.
Urinals	Inside coated with deposit; spot welds on handle show rust; some rust and pits on inside walls and bottom inside; some staining.	Considerable rust inside at welds (handle); moderate staining or rust in neck and some pitting inside bottom. One had fabrication tear at pour lip.
Instrument trays with covers (8" x 2½" x 1½").	Except for slight dulling and baked-on deposits of previous contents, no defects.	Same as type 302 plus slight rust on one cover inside.

CONCLUSIONS: It was the consensus of those examining the utensils that there was a definite need for improved cleaning techniques. It was their opinion that proper cleaning should improve corrosion resistance of both types of stainless steel. Type 302 showed superiority in corrosion resistance. However, the usefulness of

type 430 utensils was not diminished because of the defects noted and there was no conclusive indication of early failure. One year of test proved insufficient to determine durability of type 430 stainless steel hospital utensils.

## SECOND YEAR INSPECTION RESULTS

Bedpans	Few light rust stains on outside; some rust along weld on inside, also occasional rust spots on inside bottom and rolled bead (hem).	Few rust spots and pits on outside and along weld; numerous rust spots mainly on inside weld seam and bead. Scattered tiny pits on bottom.
Kickbuckets	Occasional discolored area on outside; few scattered rust stains, discolored areas, and etched spots on inside. One had several dark etched areas. Rust at a bail ear was observed on one.	Mottled and discolored on outside. One showed rust staining on outside bottom and mottled rust stains on a bail ear. One bucket, showing evidence of improper use, had four severe etched areas on curve of inside bottom; one area was perforated to the outside, making the bucket useless. Another bucket showed heavy etching on inside, with extensive discoloration to bottom third of bucket. Many etched and red rust spots and tiny pits were noted in discolored area.
Urinals	Occasional red rust stains at edge of rolled rim; superficial corrosion at handle welds; inside heavily discolored and coated with deposit; scattered rust spots on inside.	Rust on rolled rim; occasional rust spot and pits on outside. One had fabrication tear on pour lip. Heavy deposit on inside with discoloration pitting and rust spots on inside weld area.
Instrument trays with covers (8" x 2½" x 1½").	Slight dulling of sheen on inside	Occasional tiny pit and rust spot on inside.

CONCLUSIONS: After examination by essentially the same group who inspected the items 1 year earlier, it was felt that only moderate changes in type 302 chrome-nickel stainless steel were noted. Aside from the perforated kickbucket, serviceability of utensils was not significantly diminished by the use of type 430 non-nickel stainless steel. It was again evident that proper

or complete cleaning was not accomplished and that this point must be emphasized to obtain the best service from all stainless steel utensils in hospitals. It was the opinion of the inspecting group that type 302 stainless steel showed superiority over the type 430, but additional testing should be pursued before final judgment.

quirements. With the exception of one type 430 urinal, all utensils were accounted for. These were inspected by representatives of interested Government agencies, including stainless steel and corrosion experts from the National Bureau of Standards, Armed Services Medical Procurement Agency, and the Business and Defense Services Administration of the Department of Commerce.

After a review of the findings, it was decided at a subsequent industry advisory committee meeting that the utensils should be tested further and that the testing institution should, preferably, be near the seashore so the effects of salt air on the utensils could be studied. The Department of Defense arranged for a controlled test at the Key West Naval Hospital in Florida.

The second test was completed and the utensils were returned to Washington for inspection by the same agencies. (One urinal and one kickbucket, both type 430, were misplaced and not returned from Key West). Results of the two tests appear on facing page.

#### Operating Room Furniture

In addition to the control on the use of nickel in utensils, the National Production Administration, early in 1951, had issued a restrictive order (NPA Order M-80) which prohibited the use of nickel steel in the manufacture of operating room furniture.

By a fortunate coincidence, purchase orders for equipment for the Clinical Center at the Public Health Service National Institutes of Health, then under construction, were being compiled. With this opportunity to test operating room furniture made from type 430 stainless steel, specifications were modified on a selected list of items. The following type 430 stainless steel items containing no nickel were among those obtained from the manufacturer:

- 1 linen hamper.
- 3 stands, irrigator (not placed in service).
- 1 stand, solution, single, Baker model.
- 1 stand, solution, double, Snyder model.
- 1 table, major operating pedestal, large.
- 2 stands, instrument, Mayo.
- 1 stool, anesthetist's, Bryson model.
- 2 stools, foot, 10' x 14' x 8'.
- 2 stools, revolving.

1 stool, foot, 12' x 30' x 4'.

2 tables, instrument, curved, 12' x 60' x 33' (not placed in service).

1 table, utility, 16' x 20' x 33'.

1 table, utility, 16' x 20' x 30' (not placed in service).

The operating room furniture serving as controls has not been listed above because adequate control was afforded by the normal course of simultaneous purchases of type 302 duplicate chrome nickel items for the other Clinical Center operating rooms. The operating room furniture was placed in general service in July 1953 at the Clinical Center. After 1 year of use it was inspected by the Sanitary Engineering Branch of the Division of Research Services, National Institutes of Health, and was then returned to routine service for a second year. The operating room furniture was inspected at the end of the second year by the National Bureau of Standards as well as the Sanitary Engineering Branch.

Detailed reports on individual items of operating room furniture for the first year were not received. However, all furniture pieces fabricated from type 430 stainless steel compared favorably with the type 302 items, except for surface scratches. Both types of furniture were kept in continual and equal service, and all surfaces were kept scrupulously clean. No significant signs of rust, pitting, or staining were reported at the end of 1 year. Detailed results of the second year tests follow.

#### Continuation of Tests

Upon completion of the second year of testing and inspection, the interested agencies agreed that periodical examination of the equipment should be continued indefinitely. Preferably, this additional testing would continue until failure of each item.

In addition to the continuation of the tests at the Clinical Center, the Bureau of Medical Services of the Public Health Service provided another site for the utensil testing, the Public Health Service Hospital in Baltimore, Md. By the use of a "quarterly inventory-annual report" system, followup information is expected to be current. Due to the long period which may be required, each utensil was engraved "on

## Operating Room Furniture

### SECOND YEAR INSPECTION RESULTS

Item	Type 302 (8 percent nickel)	Type 430 (no nickel)
Utility tables	A few scratches on surfaces	Top scratched and discolored. Discoloration but no rust at welds.
Stools, revolving	No indications of rust	Slight rust where ring welded to legs on one.
Operating tables	do	No indications of rust.
Solution basin stands, single	do	Some discoloration at welds but no rust stains.
Solution basin stands, double	do	No indications of rust.
Stands, Mayo type	do	Do.
Stools, anesthetist's	do	Do.
Stools, foot	Slight rust stains at junction of lines with seat and at welds on legs.	Definite rust at junction of lines with seat and at welds on legs.
Linen hamper racks	Few scratches; clean welds	No indications of rust; clean welds.

CONCLUSIONS: The summary judgment reached by those examining the items was that type 302 articles are in slightly better condition than type 430. The difference, however, is not significant at this time. The evidence of excellent cleaning was apparent for all items

inspected. An interim judgment would suggest that hospital operating room furniture fabricated from type 430 chrome stainless steel would be sufficiently durable to serve as a satisfactory alternate for type 302 chrome nickel stainless steel.

test" and assigned an arbitrary number for positive long-term identification. Information as to failure or significant signs of early failure will be forwarded to mobilization planning agencies at appropriate intervals.

The marked evidence that routine cleaning methods of the utensils was inadequate obviously indicates that more information on the care of stainless steel should be disseminated. In this regard, through the efforts of the National Research Council and of the American Iron and Steel Institute, the preparation of a comprehensive booklet covering the care of stainless steel is being considered. Hospital administrators and others concerned with extending the life and maintaining the appearance of

stainless steel utensils and fixtures will find such a booklet very practical.

#### Summary

After 2 years of service testing of hospital utensils and operating room furniture, there is evidence that nickel-bearing stainless steel, with its corrosion resistance characteristics, is superior to non-nickel stainless steel. The margin of superiority noted, however, was not conspicuous in the furniture. With the exception of one kickbucket, deterioration was generally not severe or of a nature to destroy the usefulness of the article. Only minor instances of deterioration were observed in the non-nickel stainless steel operating room furniture.

## Professional Nurse Traineeship Program

In a new program enacted by Congress on July 23, 1956, the Public Health Service is providing traineeships to assist graduate nurses in furthering their professional education.

For the academic year 1956-57, 553 traineeships totaling nearly \$2 million have been awarded under the new law (P. L. 911, Title II) to 56 schools of nursing and schools of public health throughout the United States and in Puerto Rico.

Mary O. Jenney, a Public Health Service officer since 1942, is in charge of the new program. She had been with the Division of Hospitals since 1947.

# The American Cancer Society

By THEODORE ADAMS

IT was in May 1913 that a small group of forward-looking physicians and laymen in New York City took the decisive step of forming the parent national organization of the American Cancer Society. They named it the American Society for the Control of Cancer. The \$10,000 contributed the first year was used to publish a pamphlet and promote discussions in women's clubs of a taboo subject—cancer.

In contrast to that small beginning, the Nation in 1956 contributed \$27,000,000 to the American Cancer Society's coordinated, countrywide program of public and professional education about cancer, service to patients, and scientific research into the cause and cure of this disease.

The American Cancer Society is a voluntary organization of people united to speed the conquest of cancer. It is composed of 60 chartered divisions serving the 48 States and Alaska through 2,788 organized units and more than a million volunteers. The divisions and units operate under volunteer directors, or governing committees, composed of lay and professional people who formulate policies and program objectives within the framework of national and divisional policies. Represented on the national board of the society are all areas of the country and business, industry, law, science, medicine, and communications. The society reports annually to the contributing public about funds collected and expenditures made. The president of the American Cancer Society is Dr. David A. Wood, director of the Cancer Research Institute and professor of pathology,

University of California. Chairman of the board is Walter J. Kohler, former Governor of Wisconsin.

## Research

Research takes a big chunk out of the annual budget. This is natural, for the society believes, along with informed minds everywhere, that research is the key to the conquest of cancer. As a result, each year 25 percent of all funds received by the society have gone into its national research program. Since 1945, when this program was launched, almost \$50 million has been invested in grants for cancer research in the Nation's leading hospitals, universities, and other laboratories. Today, the work of a thousand senior scientists, assisted by some 3,000 younger workers, is backed by society funds. The investment has paid off by advancing fundamental knowledge of the life and growth processes, improved radiation and surgical techniques, and the development of lifesaving and pain-easing drugs, some of which can bring about temporary control of malignant growths.

The year 1956 also saw a dramatic reappraisal of the research program to speed developments and save lives. Approved by the board of directors were the basic recommendations of the society's Ad Hoc Research Policy Survey Committee for four types of grants for the support of research and four for the training and support of investigators. The philosophy behind the recommendations is embodied in the committee's report, which stresses continuity of research "to assure that the scientists now being trained are able to realize their maximum potential for fully imaginative and productive research, and to make a career in cancer research

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*Mr. Adams is director of the publications section of the American Cancer Society.*

so attractive as to lure the more capable and ingenious of the potential candidates."

Culminating a year's study by top-level scientists and administrators, the action was designed to meet more adequately the needs of the present advanced status of research by:

1. Establishing new types of research grants to individuals and institutions that will permit longer range planning and more flexible use of funds so that promising new leads may be pursued more rapidly.

2. Assuring more adequate manpower for cancer research by expanding the program of training to young scientists and establishing long-term faculty level positions in universities to attract more scientists to the field of medical research and keep them in it.

3. Coordinating under one Scientific Advisory Council the society's entire research program, which had become divided into a number of more or less independent efforts during the organization's rapid 10-year growth.

Following up these developments, the society, in August 1956, named 15 of the Nation's leading scientists and research administrators as members of the newly formed Scientific Advisory Council of the American Cancer Society. The appointments were announced by Governor Kohler, who said, "We have asked these scientists to serve as the primary guiding force in blueprinting the direction that our research program will take. They have a tremendous responsibility, but also the challenging opportunity to devote their talents and vast experience towards the ultimate solution of the cancer problem. The board of directors is gratified that some of the best scientific brains in the country have been assembled for this all-out attempt to discover the causes of cancer and to evolve better methods of control and cure."

Action by the American Cancer Society board directs that the new Scientific Advisory Council examine continuously progress in cancer research. The council will survey what is being done by both governmental and privately financed groups and will determine which are the most promising of the unmet needs. Recommendations will then be made for appropriation of funds in whatever categories are indicated. The council will review the recommendations

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### ACS Scientific Advisory Council

The American Cancer Society Scientific Advisory Council consists of the following:

Dr. George W. Beadle, chairman, California Institute of Technology, Pasadena; Dr. Walter J. Burdette, St. Louis University, St. Louis, Mo.; Dr. Philip P. Cohen, University of Wisconsin, Madison; Dr. Howard J. Curtis, Brookhaven National Laboratory, Upton, Long Island, N. Y.; Dr. Harold F. Dorn, Public Health Service, Bethesda, Md.; Dr. Thomas Francis, Jr., University of Michigan, Ann Arbor.

Dr. Alfred Gellhorn, Columbia University, New York City; Dr. Eugene P. Pendergrass, University of Pennsylvania, Philadelphia; John M. Russell, the John and Mary R. Markle Foundation, New York City; Dr. George Sayers, Western Reserve University, Cleveland, Ohio; Dr. Howard E. Skipper, Southern Research Institute, Birmingham, Ala.; Dr. Edward L. Tatum, Stanford University, Palo Alto, Calif.; Dr. Arnold D. Welch, Yale University, New Haven, Conn.; Dr. Milton C. Wintemitz, National Research Council (retired), Washington, D. C.; and Dr. Gordon Zubrod, Public Health Service, Bethesda, Md.

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of special scientific advisory committees dealing with specific areas of responsibility such as the cause, pathogenesis and treatment of cancer, institutional research grants, and personnel for research. Special areas will also be covered. For example, continuation of the existing Research Advisory Committee on Lung Cancer was authorized.

### Education

The public education program of the national society is enhanced by year-round programs in the divisions. The program is concerned with audiences and is projected under formal headings of mass media, employee education, club and organization, school and college, and neighborhood educational programs. In 1955 more than 60 million copies of the society's leaflet, "Seven Danger Signals," were distributed. The same year the society's work in public education was strengthened by the establishment, as a

standing committee of the national board, of a Public Education Committee under the chairmanship of Dr. Frank M. Stanton, president of the Columbia Broadcasting System.

On the State and local level, the society's divisions and units work in cooperation with other national organizations, thereby reinforcing divisional public education activities. In 1955 the American Cancer Society worked with the American Public Health Association, the Industrial Medical Association, the National Science Teachers Association, the National Conference for Cooperation in Health Education, AFL-CIO, the Women's Auxiliary of the American Medical Association, the General Federation of Women's Clubs, and many others.

A recent public opinion poll has shown excellent results from the American Cancer Society's education program, although groups of low income and of lesser educational advantage still need much attention.

A major objective of the society's professional education program is to alert physicians everywhere to the possibility of cancer in all patients and to provide them with information that will aid its detection in an early, curable stage. A second objective is to improve the means for the diagnosis and effective treatment of cancer through special training given individual physicians. Closely related are the society's medical service activities, which provide needed medical laboratory services, equipment, and forms of organization designed to assure accurate case records and consultation between physicians on treatment and followup procedures. Close cooperation with State and local medical societies and hospitals is the rule. Grants are made to institutions approved for postgraduate training by the American Medical Association's Council on Medical Education and Hospitals, the institutions themselves designating the individual fellows. Thus, physicians completing their fellowships enter or return to practice with invaluable direct experience in basic medical problems of cancer.

Since the start of this program in 1948, a total of 864 fellowships has been awarded to 56 institutions. In addition, since 1950 grants of the society have contributed each year to the advanced training in cancer for physicians at the Memorial Cancer Center, New York City,

where 122 fellowships were awarded for the 1955-56 academic year alone. Since its inception in 1948 a total of \$2,493,690 has been devoted to this program.

The society publishes two bimonthly periodicals: *Cancer*, a scholarly journal for the clinical investigator, and *CA: A Bulletin of Cancer Progress* for the practitioner. The society's medical library prepares special bibliographies on cancer and issues to medical schools and libraries *Cancer Current Literature*, a monthly index. Other activities of the society for the benefit of the medical profession include a cancer monograph series, demonstration slides, medical exhibits, and special films.

### Service

Units in most divisions of the society are organized on a county basis. Since much of the society's work is medical in character, local medical societies, hospitals, and departments of health are broadly represented on unit boards. In addition to basic community education and campaign activities, many of the units participate in hospital diagnostic and consultative services, cancer registries, cancer detection programs, lung cancer screening programs, nursing service, medical social work, and transportation of patients.

In 1955, 2,590 cancer information centers for the public were maintained by units, 410 of them on a full-time basis. Financial support was given to 387 hospital diagnostic and treatment services. Subsidies to visiting nurses' organizations made possible 202,103 visits to needy cancer patients.

Approximately one-third of the society's volunteers are engaged in service activities for cancer patients and their families. Almost 200,000 volunteers made 19,110,380 cancer dressings, which were distributed free to cancer patients. Unit loan closets, equipped with sick-room necessities, were supplied free to 20,754 patients.

### Liaison With NCI

The society maintains continuous liaison with the National Cancer Institute of the Public Health Service. Working together, the two

organizations have sponsored national cancer conferences at which all aspects of the problem have been reviewed and new developments in research and therapy brought to public attention. The third National Cancer Conference was held in Detroit, June 4-6, 1956, and was attended, in addition to United States leaders in this field, by a distinguished contingent of cancer specialists representing 22 foreign countries. Also, to give all possible assistance when requested by proper authorities in foreign

countries, the American Cancer Society has in operation a board committee and foreign desk to maintain liaison with the Department of State and foreign embassies and to answer queries from abroad. More than 500 requests for information were received from 69 countries in 1955.

Thus the society, while pursuing its own threefold goal of research, education, and service, acts as a national and international catalyst to end the scourge of cancer.



## INTERNATIONAL MAIL POUCH

### ***Inoculation—Local Style***

In remote sections of Afghanistan, which is larger than Texas, it has been the practice of "mullahs" to inoculate villagers with matter from pustules of patients with active smallpox. Many villagers bear scars on the dorsum of the hand between the first and second metacarpals as evidence of this practice. Near Lashkar Gah, one such mullah practicing his art left a wake of dead children, hand infections, and axillary abscesses, products of a combination of smallpox and septicemia. The Lashkar Gah staff saved many children, but the mullah escaped.

—LESLIE J. DEGROOT, M.D., *acting public health adviser, United States Operations Mission to Afghanistan.*

### ***"Stamping" Out Malaria***

The Government of India has issued a 6-anna postage stamp bearing the legend "malaria control" with two scenes; one depicts poverty in malarious areas, the other shows prosperity after DDT. With

a history of more than a million deaths annually from malaria, India is waging a large and successful control campaign.

—JOHN J. HANLON, M.D., *chief, Public Health Division, International Cooperation Administration.*

### ***Rural Health Teams***

Extension of rural health services in the Philippine Islands has reached the point where more than a third of the smallest governmental units have the basic team of physician, nurse, midwife, and sanitary inspector. Two-thirds have at least three of the team. More than 9 in 10 had at least one public health official. Training centers plan to provide field experience for more than 7,000 community development workers. Malaria control has progressed to the point where housewives question the need for further spraying of their walls since none of the family has had the fever for a year.

—MALCOLM J. FORD, M.D., *rural health adviser to the Republic of the Philippines.*

# Syphilis Morbidity Reporting by Private Physicians

By EUGENE E. TAYLOR, M.D., M.P.H., and JOHN J. WRIGHT, M.D., M.P.H.

THE PROCESS by which private physicians report cases of communicable disease has often been a source of concern to public health officials. These officials have feared that reports were incomplete and were an unreliable basis for attempts to measure a communicable disease problem.

Syphilis case reporting presents certain distinctive difficulties in addition to those characteristics of general communicable disease reporting. This paper will describe how a group of North Carolina physicians view this problem. These physicians were questioned about the extent to which they reported cases of syphilis, their reasons for reporting or not reporting, and their opinions on the proper use of case reports by health departments. The interviews were carried out in the course of a more comprehensive survey of public health problems in the management of syphilis by private physicians.

Syphilis case reports are needed by official health departments as an index of the extent of the syphilis problem and also as a basis for initiating specific preventive action—particularly contact investigation. At present many authorities believe that, because of the lowered

cost of treatment, an increasing proportion of patients with early syphilis are seeking treatment from private physicians rather than from free clinics sponsored by health departments (1). If this is true, organized syphilis control activities may become increasingly dependent on the accuracy and completeness of physicians' reports.

## Collection of Data

Our data consist of what physicians said about their own practices, opinions, and attitudes. Systematic observations of their work were not done as part of this study. Our principal informants were 74 practicing physicians in 5 counties and 2 cities of central North Carolina. These physicians included all general practitioners and internists practicing in the 5 counties and in 1 city (25,000 population), excluding a few physicians from these areas who were interviewed during the pretesting of the interview schedule. The physicians from the other city (70,000 population) included all Negro general practitioners and internists and a sample constituting one-third of all white general practitioners and internists (exclusive of the full-time staff of a teaching hospital) chosen at random. Of the total of 74 physicians, 64 were general practitioners and 10 were internists; 59 were white and 15 were Negro. Four well-organized local health departments served the study area.

Pretesting interviews were carried out during the winter of 1951-52 with a separate group of 27 private physicians and 8 public health

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physicians from the same general area. The 74 standardized interviews were carried out in April and May 1952.

In the analysis of data, physicians' answers were grouped together in appropriate categories. Sometimes more than one answer would be given to a question, the informant indicating alternative actions he might take under various circumstances. Therefore, percentages of physicians giving various types of answers may add to more than 100 percent. During both pretest and standardized interviews, many of the comments by physicians were written down verbatim. Examples will be given to illustrate the kinds of individual response grouped into particular categories.

### Response by Physicians

Physicians were asked whether they would report their syphilis cases by name to the health department. Answers were immediately classified by the interviewer according to a scale, as shown in table 1. Over one-third of the physicians claimed to report all cases, while less than one-tenth of the group asserted they never reported a case. On the other hand, two-thirds admitted failure to report at least some cases. The most important fact emerging from table 1 is that it tends to confirm the presence of a real problem centered in the reporting process.

### Reporting Practices

Depending on their initial answer, physicians were asked alternative questions as to why they did or did not report syphilis cases. Answers to these questions are summarized in table 2. Doubts as to the confidentiality of reports and the closely related factor of patient status were the outstanding reason for "not reporting" cases, followed by indifference or hostility to the administrative paper work required. Outstanding among reasons "for reporting" cases were an awareness that "it's the law," plus recognition of the value of case reports to the health department (*a*) for carrying out specific control activities or (*b*) for statistical studies.

Twenty-nine, or about 40 percent, of the physicians expressed concern that the identity of their patients would not remain secret and that patients would suffer as a consequence.

**Table 1. Physicians' answers to question: "When you find that a patient has syphilis do you report his name to the health department?"**

Reply	Physicians replying	
	Number	Percent
Report all cases.....	26	35. 2
Generally report, sometimes do not report.....	17	23. 0
No general policy or tendency.....	6	8. 1
Generally do not report, sometimes do report.....	19	25. 7
Never report a case.....	6	8. 1
Total.....	74	100. 1

Reasons given by individual physicians for this fear included:

1. Chances of improper disclosure multiply as each additional person has legitimate access to information.
2. Health department clerks are not adequately trained in medical ethics.
3. Health department offices sometimes are not physically adequate for protection of confidential information.
4. Though the health department employee may keep information confidential, his own knowledge may harm the patient indirectly, particularly in small towns and rural areas.
5. Specific incidents, not necessarily involving a case of syphilis or even the health department, have impressed the physician with the speed of travel of gossip and rumor.

The following statements illustrate these points of view:

"Most people don't want everyone knowing they have syphilis. When three people know anything, it's out."

"I'm sure that the nurses and other trained persons at the health department keep things confidential. But the clerk is hired right here in town and has had no particular training. She might not keep things confidential."

A health officer interviewed during pretesting of the interview schedule: "Often the physical facilities are such in health departments that information cannot be kept confidential. . . . In my own health department, I share an office with five other persons. Sometimes it has been impossible to have records

**Table 2. Factors influencing physicians' decisions not to report or to report syphilis cases as a general rule or in individual instances**

Factors influencing decision	Number of physicians replying	Percent of 74 physicians
<i>Not to report</i>		
Fear that information about patient will not remain confidential	29	39.2
High status of patient or personal friendship of physician for patient	10	13.5
Hostility to "making reports" and "red tape"; indifference; "no reason"	10	13.5
Various clinical characteristics	5	6.8
Ability of patient to cooperate with physician	2	2.7
Miscellaneous	5	6.8
<i>To report</i>		
Legal requirement to report	20	27.1
Recognition of health department's need for case reports in order to carry out control measures with individual patients and families	19	25.7
Recognition of health department's need for case reports for statistical studies	11	14.9
Inability of patient to cooperate with physician	9	12.2
Patient being referred to health department for treatment	7	9.5
Various clinical characteristics	5	6.8
Miscellaneous	5	6.8

locked up and we have found evidence that the janitor and janitress have looked through records."

"A few prominent patients would be reported as 'X' rather than by name. This is because they know people who work in the health department. In a small town you have to consider this even though the clerk in the health department here is a very fine person."

"One of my patients had a blood test done which was negative. A friend of hers, who worked in the public health lab, told her, 'I saw your blood going through.' I figured this friend might tell if someone had a positive test, so I use numbers and don't report by name."

The patient's status was cited by 10 physicians (14 percent) as a factor influencing their reporting practices.

"If the patient was a friend or an outstanding person in the community I wouldn't report his name to the health department. No good would be accomplished by having it publicized."

Ten physicians mentioned the work involved

in reporting or said they simply neglected or forgot to report cases.

"I have no scruples against it. I just don't do it."

"It takes too much time and red tape. I know the statistical value and contact tracing value, but there is too much time required of the doctor and no compensation given."

Two physicians stated that cooperation on the part of the patient in following orders would influence them not to report while nine physicians stated the converse—that lack of cooperation would influence them to make a report. Case holding during therapy itself is no longer the problem it once was; however, adequate followup is still a long-term process which does require understanding and cooperation by the patient.

Certain clinical characteristics of individual patients were named as reasons for "not reporting" by five physicians. These were "old cases," "partially treated cases," "cases with a 'doubtful' blood test," and "noninfectious cases." Other clinical characteristics were named by five physicians as reasons "for reporting." These were "prenatal patients," "infectious cases," and "seroresistant cases." In general, the first group of characteristics suggests less urgent need for action on the part of the health department than does the second group of characteristics. This is an encouraging finding; however, it would not be justifiable, on the basis of these data alone, to conclude that all or even most of the cases regarding which the health department should take action would be selected by the physician for reporting.

In general, the interviewer gained a distinct impression that physicians were uncertain about how to answer the question: "Why do you report?" Lack of cooperation by the patient and the clinical characteristics of the case have been mentioned. The most frequent answers were that reporting was required by law, that reports were needed for control measures centered around the individual case (for example, contact investigation and followup), and that reports were needed for statistical studies (table 2). But to the interviewer, the answers seemed vague, and few concrete examples were given from the doctor's own experience.

"It's the law."

"The only reason I know for reporting is that public health has helped by taking over syphilis. There used to be many inadequately treated cases."

"I feel cases should be reported. I'm not sure why. I have just been led to that opinion by the health department."

Seven physicians mentioned that some cases would be reported merely as a part of the process of referring them to the health department for treatment. Finally, a variety of miscellaneous reasons were cited by a very few physicians each to explain why cases were or were not reported. A few are of possible importance though not mentioned frequently by our informants, for example:

"The reporting of infectious disease has been backsliding for years. It's silly to report measles and chickenpox. This attitude carries over to the reporting of syphilis. We report polio, typhoid, TB—but we don't report syphilis as well as we should."

As stated above, our informants recognized certain uses which a health department might make of case reports. Additional questions were asked to learn more about physicians' concepts of the role, actual and desirable, of the health department in control measures aimed at the private patient.

#### *Health Department Control*

Forty-nine physicians, excluding the 25 who never or only rarely make a case report by name, were asked: "In your opinion, should the health department take any action when a private doctor reports that one of his patients has syphilis?" The type of "action" which might be taken was purposely left unspecified. Answers are shown in table 3.

The majority of the physician informants had reservations about health department "action" (table 3). One-tenth said that the health department should take no action and mentioned no exception. About 40 percent said action should be taken only on the specific request of the private physician. And it is probably fair to say that the one-third who rarely or never report their cases would also be opposed to the health department taking any part in the management of their private patients. Finally, a minority of 10 (14 percent) informants voiced definite opinions that the health

department should take specific types of action—investigation of contacts, followup of patients to insure adequacy of treatment, or education of the patient.

A possible explanation for physicians' reluctance to have the health department carry out specific control measures with private patients is that the physicians are uninformed or misinformed as to what this action might be. For example, physicians have traditionally feared and opposed any third person working independently with their patients, thus possibly interfering in the physician-patient relationship.

Actually, according to the health officers, all four local health departments in the areas surveyed followed a policy of not making any contact with the patient or members of his family, except with the approval of the private physician. To study physicians' knowledge of this policy, all 74 informants were asked: "In this county, does the health department usually contact the patient or family directly when a doctor reports a case of syphilis?" Answers are summarized in table 4.

The majority (57 percent) thought, correctly, that the health department did not contact the patient or family directly, that any contact was

**Table 3. Physicians' answers to question: "Should the health department take any action when a private doctor reports that one of his patients has syphilis?"**

Reply	Physicians	
	Number	Percent
Health department should take action.....	10	13.5
Investigate contacts.....	(6)	(8.1)
Check to see that patient completes treatment.....	(5)	(6.8)
Send patient educational literature.....	(1)	(1.4)
Health department should not take action unless specifically requested by private physician.....	29	39.2
Health department should not take action (no exceptions mentioned).....	8	10.8
Other.....	2	2.7
Question not asked because physician rarely or never reports a case by name.....	25	33.8
Total.....	74	100.0

initiated on the request of the private physician. However, 30 percent were uncertain, and 12 percent thought that the health department took independent action when a case report was made. Of the latter group of 9 physicians, 5 rarely or never reported cases; 1 usually reported his cases but was opposed to the health department's initiation of any control measures on the basis of the reports, and 3 physicians said they reported all cases and felt that the health department should proceed on its own initiative with contact investigation.

If a health department is to carry out control measures related to the private patient on whom a report of syphilis is made and yet is not going to bypass the physician, a basic action is to initiate discussion of the case with the physician. Health department and physician together must arrive at some working arrangement as to what is to be done, and by whom. A logical extension of this type of health department action is to contact the private physician who has submitted to the laboratory a blood sample which is positive to a serologic test for syphilis (STS)—if a case report is not received in 2 or 3 weeks. (To make this procedure practicable, a central file must first be checked to eliminate previously reported cases.) If the diagnosis is complete, assistance can be offered to the physician and a case report can be made immediately. If the health department laboratory performs most of the STS for the area, the completeness of case reporting and the extent

of use of health department control services should increase markedly.

At the time of the survey, none of the four health departments in the study area were carrying out the policy described. Since other areas of the country had reported success with such a policy (2), we endeavored to find out whether or not our informants would view it with favor. The answers of the 74 informants to this question are shown in table 5.

Table 5 suggests that the physicians were more favorable toward this specific type of health department action than toward the general idea of control activities directed at their syphilitic patients. Fifty-seven percent indicated they were in favor of the policy outlined, 26 percent were opposed to it, and 18 percent made comments that could not be definitely classified as favorable or unfavorable.

Interesting arguments were given for and against the hypothetical policy. Some physicians felt such a policy would be of definite help to them in clinical management and in preventing patients from being lost to medical observation:

"This would be an excellent policy because we lose patients. My partner and I see 70 to 80 patients a day. When we get through the day we don't have time to trace people down. I write the patients letters and they ignore them. The public health nurses could get out and run them down."

"This policy would leave no loopholes. It would make sure the doctor gets the blood test report. It would find whether or not the health department can be of help. It would save the doctor time. This is a factor in general practice."

Other physicians felt that the hypothetical policy would be unnecessary and expensive:

"It would be all right. But I feel the measures already being done are handling the problem pretty well. I used to find 15 percent positive tests, and only about 1 percent now."

"It seems to me there would be a duplication of effort. Here we try to reduce the health department work to a minimum. I feel this policy would not be necessary."

Again, some doctors felt that initiation of discussion of the case by the health department would be an objectionable interference in the physician-patient relationship, some mentioned their dislike of having the government involved in their work, and some objected to the

**Table 4. Physicians' answers to question: "In this county, does the health department usually contact the patient or his family directly when a doctor reports a case of syphilis?"**

Reply	Physicians	
	Number	Percent
No, health department does not usually contact patient or family directly.....	42	56.8
Not certain or do not know.....	23	31.1
Yes, health department usually does contact patient or family directly.....	9	12.2
Total.....	74	100.1

**Table 5. Physicians' answers to question: "Some health departments have the policy that whenever a doctor sends to the laboratory a blood sample that is STS positive, the health department contacts the doctor, discusses the case with him and offers assistance. What do you think about such a policy?"**

Reply	Physicians replying	
	Number	Percent
In favor.....	42	56.8
Opposed.....	19	25.7
Other.....	13	17.6
Total.....	74	100.1

health department taking the initiative away from them:

"I think it would be a good thing but I just don't like government interference."

"I wouldn't like this. It's better to leave it up to the doctor. This policy takes the initiative away from the doctor—undermines his interest in the case. And as a general rule the doctor will take more personal interest than the health department will in the patient."

One internist who favored the policy in general thought it should not be applied too rigidly. If the health officer had confidence in a particular doctor, he could assume that that doctor would "carry through with what was needed." If another doctor had not shown too much interest in syphilis, it might be necessary for the health officer to "keep in pretty close touch with him."

In summary, tables 3-5 suggest that physicians were suspicious of the general idea of health department participation in patient management (table 3); however, at the time of the interviews, they generally did not feel that the health department was participating to an objectionable degree (table 4); and finally the majority were willing for the health department to participate to a greater degree by at least initiating inquiries of the physician based on positive STS reports (table 5).

## Discussion

Many problems and issues arise in the process of obtaining and using syphilis case re-

ports. The data presented have bearing on several of these problems.

### *Completeness of Reporting*

The first and most important problem pertains to completeness of reporting. We cannot make a numerical estimate of the completeness of reporting by our informants, but it appears reasonable to conclude that many cases were not being reported.

This general conclusion is in agreement with a number of studies from other areas and periods of time. Rock (3) studied a series of 436 cases of syphilis from the Eastern Health District of Baltimore discovered by private physicians during 1932-37 and found that only 71, or 16 percent, had been reported to the Baltimore City Health Department. The Report of the WHO Syphilis Study Commission (4) states that in the United States "reporting by private physicians is variable, and, from our information, appears to be low." Lentz and Beerman (5) in 1952 mailed a questionnaire to all physicians known to be in private practice in Philadelphia. Replies were received from 75 percent of the physicians, who indicated that in 1951 they had treated 3,112 cases of syphilis. During the same period, the Philadelphia Department of Public Health had received reports for only 753 cases—less than 25 percent of the total treated, even assuming that physicians not replying to the questionnaire had discovered no syphilis.

Judging from the information received from our informants, the most serious obstacle to complete reporting is the desire of patient and physician to keep the diagnosis of syphilis a secret. The stigma attached to venereal disease has probably decreased in recent years, but it is unlikely to disappear entirely. Apparently, the physician often feels he must choose between a risk to his patient which is concrete, obvious, and within the physician's experience and a possible value to the community which is vague at best.

### *Keeping Reports Confidential*

Certain steps can be taken by a health department to insure that case reports remain confidential. Physical inadequacies which make records and files accessible to unauthor-

ized persons can be attacked directly. Clerical and other personnel can be given additional training and supervision in the handling of confidential records. If these accomplishments are brought to the attention of physicians, they may feel free to submit more complete reports.

But there are limits to how effective these measures can be. When the health department employee who receives a report of a case of syphilis is a personal acquaintance of the syphilitic patient, harm may have been done the patient even if information travels no farther. This will be a particular problem in rural areas and small towns. And despite all precautions, the length of the route of communication in the reporting process (doctor's office to local health department to State health department) allows many possibilities for information to be diverted into improper pathways.

High social status of the patient and his willingness to cooperate with the physician influence the latter's decision not to report a case of syphilis. These factors cannot be altered directly by health department action, except by the above measures and by any other action which gives the physician and his patient greater faith in the confidentiality of the reporting process.

#### *Simplifying Reporting*

Some informants complained about the "red tape" of the reporting process. It is true that somewhat more effort and specialized knowledge are required to complete the usual syphilis report form than to make a report of most of the other communicable diseases. Possibly the total volume of paper work required of the physician could be reduced by eliminating so-called compulsory, but probably very incomplete, reporting of some of the common communicable diseases, such as measles, for which there is no very effective control program in operation.

This would leave the physician with more time for, and possibly more interest in, the reporting of diseases, such as syphilis, which are more important from the standpoint of specific preventive action which can be taken by the health department. The American Public Health Association's manual, *Control of Communicable Diseases in Man* (6), has re-

cently reemphasized that: "Diseases are often made reportable although the information gathered is put to no practical use. This frequently has the result that the general level of reporting deteriorates, even for diseases of much importance. Better case reporting is usually to be had by restricting official reports to those diseases for which control services are provided, or potential control measures are under evaluation, or epidemiological information is needed for a definite purpose."

#### *Reasons for Reporting*

While our informants had quite substantial reasons for "not reporting" syphilis cases, their reasons "for reporting" seemed vague and unconvincing. The health department may be able to take steps which will increase physicians' positive motivation to report cases.

Despite the fact that all States require that syphilis be reported, the law is seldom enforced. Nor does it seem likely that attempts at real enforcement would be successful.

It may be possible to increase physicians' interest in contributing to good statistical data. We have no definite recommendations for accomplishing this. A means will have to be found to make syphilis morbidity data of more concrete interest and value at the local level. At present, if the physician does see the data he has contributed, it is usually in the form of consolidated figures for State or Nation. He may see local rates in his health department's annual report, but these also are not of dramatic interest, and they lack the respectability associated with large numbers.

Next to the legal requirement, the factor most frequently mentioned as influencing our informants to report cases of syphilis was an awareness that the health department needed the reports to carry out certain control measures with individual cases. A health department should make it clear to private physicians that, with rare exceptions, staff members do not attempt to carry out these measures without notifying and coordinating their efforts with the physician. This knowledge should help the physician who fails to report a case because he fears the health department will harass the patient. Also it will be of interest to the occasional physician who expects and wants the

health department to go ahead routinely with such procedures as contact investigation and followup when he makes a case report. He should know that if he wants these procedures done he must specifically request them.

#### *Use of Laboratory Records*

Despite all the various measures which can be suggested to improve reporting, it seems unlikely that complete reporting can be achieved on a voluntary basis. Reporting can be made a more nearly compulsory procedure if the health department has access to a large part of the reports of STS done in the area, and if it uses these as the basis for case reports. For this procedure to be completely successful, the health department laboratory must perform most of the STS done in the area, or there must be a voluntary arrangement giving the health department laboratory access to positive STS reports from private laboratories. A recent Public Health Service manual gives a clear outline of the details of this reporting system (7).

The majority of our informants were in favor of the laboratory records of positive STS being used in this way (table 5). The health department carrying out such a policy must decide how much time and effort can be devoted to it. The work can be kept to a minimum. Report cards can simply be mailed to a physician for each patient on whom a positive STS report is received and for whom no case report is on file. Or a great deal of effort can be expended. Physicians can be telephoned, and a case report can be made out at that time, making it convenient for them to request information about clinical problems or help in followup and contact investigation. As suggested by one informant, more time may need to be spent with some physicians than with others. Or it may be of interest periodically to devote particular study and effort to specific types of cases, for example, infectious syphilis, or perhaps central nervous system syphilis.

Actually, according to a personal communication dated June 4, 1956, from Dr. Warfield Garson, chief, venereal disease section, North Carolina State Board of Health, since 1953 (about 1 year after this survey) the general procedure outlined has been carried out in

North Carolina with STS reports emanating from the State laboratory of hygiene.

Whenever a case of possible primary or secondary syphilis is brought to the attention of the State board of health through surveillance of laboratory reports, a confidential serology report is routinely sent to the county health officer in the physician's area. The health officer is requested to contact the private physician concerning reporting the case and to offer consultative, diagnostic, and epidemiological aid. In many instances, a venereal disease investigator on the staff of the State board of health or the county health department gets in touch with the physician and attempts to make a working arrangement for carrying out contact investigation and other indicated public health measures. These procedures have allowed for an increase in private physician reporting of syphilis from 7 percent of the total cases in 1953 to 35 percent in the fiscal year 1956.

As suggested by our informants, some physicians may resent this type of health department action. Depending on local circumstances, the benefits may or may not be worth the price. Additional physicians may begin to send their blood specimens to private laboratories in order that the health department will have no record of the tests. Others may choose to use initials or code numbers instead of correct names on the laboratory slip. However, when this happens the health department could still conceivably discuss the case with the physician, clinical and epidemiological problems could be reviewed, and contacts could be reported for investigation.

#### **Summary**

During a survey of public health problems in the management of syphilis by private physicians, 101 private physicians and 8 public health physicians in central North Carolina were interviewed. This report discusses survey findings relating to case reporting. Results are based chiefly on interviews during 1952 with 74 private physicians who answered a set of standardized questions.

Two-thirds of the 74 informants indicated that they did not submit case reports on some of their private syphilitic patients. The most

frequent explanation for "failing to report" cases of syphilis was fear that the information would not remain confidential.

Most frequent reasons "for reporting" cases were that it was legally required, that the health department needed reports in order to carry out specific control procedures, and that reports were needed for statistical studies.

The majority of informants said they would be in favor of the health department using positive reports of serologic tests for syphilis (STS) on blood samples sent to the public health laboratory, as a basis for case reports. However, a sizable minority were opposed to or undecided about this procedure.

The findings of this survey cannot be applied uncritically to other areas. However, certain lines of action by health departments to improve syphilis morbidity reporting are suggested:

1. Do everything possible to protect the confidentiality of syphilis case reports. Consider physical protection (files and locks), the number of people having access to reports, and the training of personnel in medical ethics. Let physicians in the community know the measures being taken to keep reports secret.

2. Restudy the entire communicable disease reporting system and, where possible, eliminate paper work required of the physician.

3. Try to devise ways for making good statistical and epidemiological use of case reports in the local community so that physicians can see the contribution they are making when they report cases properly and completely.

4. Let physicians know that the health department does not attempt to work directly with individual private patients without the physician's knowledge and permission.

5. Consider the advantages (and disadvantages) of using laboratory reports of positive STS as a basis for obtaining complete or nearly complete case reports, for making services such as contact investigation, followup, and clinical

consultation easily available, for keeping in touch with the relative quality of syphilis management in private practice, and for making occasional special studies of particular types of cases.

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*This paper is the eighth in a series of reports on the North Carolina Syphilis Studies. The organization and original field of operation were described in a report published in the February 1949 issue of the Journal of Venereal Disease Information. The present study area included the original area plus two additional counties and one additional town. The study was supported by the Division of Venereal Disease of the Public Health Service, the North Carolina State Board of Health, and the School of Public Health of the University of North Carolina.*

# technical publications

## Directory of State and Territorial Health Authorities, 1956

*PHS Publication No. 75.  
Revised 1956. 86 pages.  
35 cents.*

Revised annually, this directory lists, as of May 1956, the title and location of each State health department and the name of the officer in charge; organizational units of individual States with the names of officials directing the units. Also included are officials of State agencies other than health agencies directing grant-in-aid programs; and State agencies officially designated for the administration of the Water Pollution Control Act and crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

## Research Grants and Fellowships Awarded by the Public Health Service in 1955

*PHS Publication No. 469.  
1956. 83 pages. 30 cents.*

This annual report lists the research grants and fellowships awarded by the Public Health Service to non-Federal institutions and to individuals for support of research and training in medical and related sciences for the period July 1, 1954, through June 30, 1955.

A preliminary statement explains briefly the entire awards program and summarizes the awards by the seven categorical institutes and the Division of Research Grants for fiscal 1955.

The listings are alphabetically arranged by State or countries, institutions, and investigators or fellows.

Following the name of the investigator is a brief descriptive title of the research, an identifying number which indicates the supporting institute, and the funds awarded for fiscal 1955. Names of fellowship recipients are interspersed alphabetically among research investigators. The type of fellowship, the department of the institution in which the recipient holds his fellowship, and the sponsoring institute are indicated.

## Vital Statistics of the United States, 1954 Volume I

*NOVS Publication.  
422 pages. \$3.75.*

This volume contains detailed, final statistics for 1954 on marriage, divorce, birth, and fetal and infant mortality for the United States, each State, each county, certain cities, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Summary tables of rates and percentages and an explanatory text are also included.

An extensive introduction explains sources, classification, and interpretation of data, and columns of the life tables.

Issued previously, volume II (1956) comprises particular statistics of mortality in 1954 by State, cause, race, sex, and age, for the areas listed above.

## Operational Memoranda on Economic Poisons

*PHS Publication (unnumbered).  
1956. 99 pages. Multilithed.*

A guide to the use of public health pesticides, this revised edition describes 23 of the newer insecticides and rodenticides.

It gives the chemical name, chemical formula, physical properties, formulations, precautions, and use experience. Information on approximate costs and tabular data on formulations and measurements is also included.

Public health officials who plan or conduct insect or rodent control programs should find this booklet particularly useful.

Copies can be obtained from the Communicable Disease Center, Public Health Service, Atlanta 23, Ga.

## An Outline Guide Covering Sanitation Aspects of Mass Evacuation

**Public health problems in civil defense**

*PHS Publication No. 498.  
28 pages. 1956. 50 cents.*

This booklet is intended as an aid to Federal, State, and local health and civil defense agencies in developing comprehensive plans for sanitation, should it become necessary to move urban populations to rural territory.

The expanded outline covers methods of protection from radioactive fallout for evacuees during transit, at assembly areas, in temporary shelters, and in reception areas.

The publication also defines civil defense terms and describes emergency sanitation procedures.

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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**Public Health Reports**

U. S. GOVERNMENT PRINTING OFFICE: 1957